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XVI FEBRUARY, 1930 No. 2

The International Journal of Orthodontia Oral Surgery and Radiography

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On Page 10

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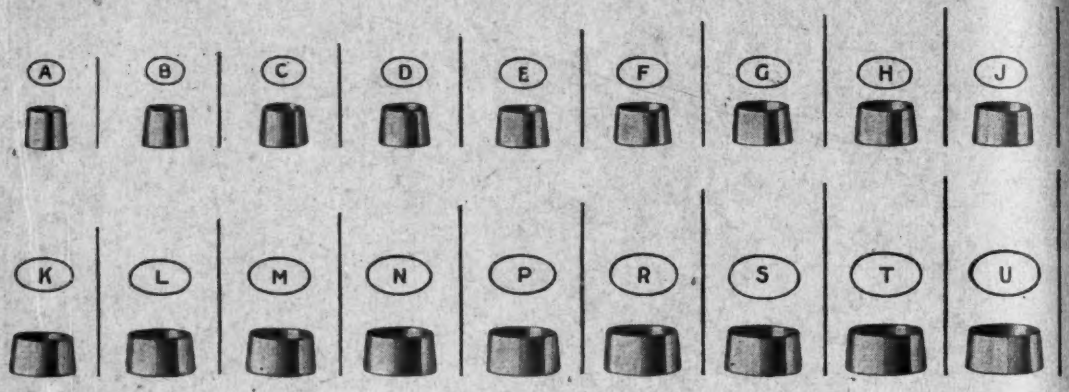

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VOL. XVI ST. LOUIS, FEBRUARY, 1930 NO. 2

ORIGINAL ARTICLES

DIFFERENTIAL DIAGNOSIS AND PROGNOSIS*

BY B. E. LISCHER, D.M.D., F.A.C.D., ST. LOUIS, MO.

THE classification and differential diagnosis of dentofacial deformities have long been topics for debate, and the various kinds of anomalies commonly included in the group under discussion today have provided some of the principal data for the disagreement which remains. Although our annual proceedings contain several noteworthy contributions to this theme, our persistent debate compels the conclusion that their interpretations were not entirely satisfactory, and that our efforts in the treatment of these anomalies are not always successful.

Because the time restrictions of our program suggest the omission of a historical review of our subject, it seems reasonable to remind ourselves briefly that two dominant conceptions have fashioned our means of comprehending all dental anomalies.

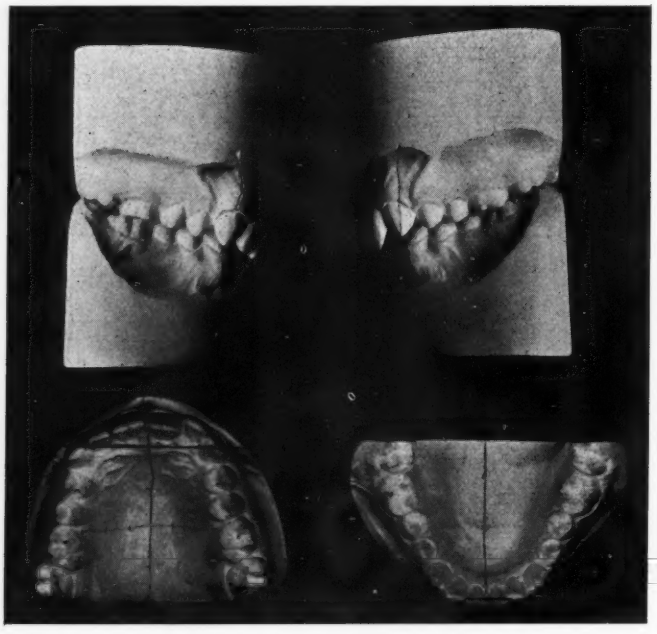
The occlusion of the teeth served as the first formative notion for numerous diagnostic classifications and more or less widely accepted intraoral methods of diagnosis. A few originators of such methods were conscious of important imperfections and serious omissions in their schemes, even admitted that the jaws might be seriously involved in certain extreme cases of oral deformity. Hence various additional diagnostic aids, namely, plastic and photographic facial reproductions, the voluntary forward bite, the insertion of wax bites and contours, lines of harmony, etc., were frequently employed to amend these imperfections.

With the aid of such an intraoral classification and on the basis of its restricted occlusal interpretations, we felt qualified to differentiate the sagittal deviations of opposing maxillary and mandibular teeth. But the sagittal

*Read at the Twenty-eighth Annual Meeting of the American Society of Orthodontists, Estes Park, Colorado, July 16-19, 1929, as part of the symposium "Apparent Distoclusion."

relations of the teeth to their respective jaws and the sagittal relations of the denture to the head, which are equally important and frequently involved, were thus ignored. Cephalometric investigations of these dependent relationships between the denture and other parts of the head provided the second significant approach to our diagnostic problems.

Gnathostatic methods of diagnosis, which embody both viewpoints and include denture deviations of width and height, as well as those of length, offer means for removing the deficiencies referred to above. The writer offers the following data to demonstrate the usefulness of these methods when applied to dental anomalies exhibiting an apparent distoclusion.



Model illustrations and graphs are reduced one-half natural size.

CASE 1.—Male, age fourteen years (Figs. 1, 2, 3). The bilateral distoclusion is very clear and is differentiated as follows:

A.—Deviations measured from the raphe-median plane and compared with Pont's index:
Maxilla: Contraction, mild, asymmetrical, lateral, dental;
Mandible: Contraction, mild, asymmetrical, anterior, lateral, alveolar.

B.—Deviations measured from the orbital plane:
Maxilla: Retraction, (¼), asymmetrical, dental, on the right side; left side –;
Mandible: Retraction, (1/1), symmetrical, total dental + alveolar.

C.—Deviations measured from the horizontal plane:
Maxilla: Abstraction, medium, asymmetrical, incisal;
Mandible: Attraction, mild, asymmetrical, anterior.

Prognosis.—We formerly called a dental anomaly of this kind a Class II, Division 2, and later a true distoclusion. It may be noted that the sagittal relation of the maxilla and the development of the mandible in both body and rami present no deviations. In attempting a correction we ought, therefore, to strive for a frontal, or anterior, movement of the

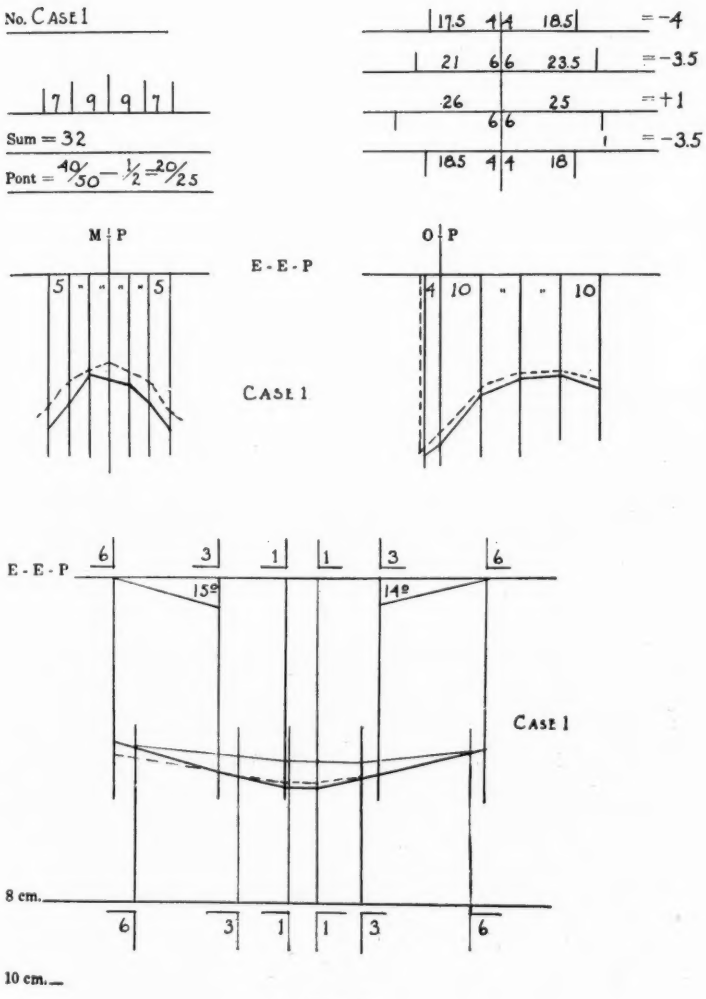

No. CASE 1
7 9 9 7
Sum = 32
Pont = 40/50 − 1/2 = 20/25
17.5 4 4 18.5 = −4
21 6 6 23.5 = −3.5
26 25 = +1
6 6
1 = −3.5
18.5 4 4 18
M P
5 " " " 5
E-E-P
CASE 1
O P
4 10 " " 10
E-E-P
6 3 1 1 3 6
15°
14°
CASE 1
8 cm.
6 3 1 1 3 6
10 cm.

Fig. 2.

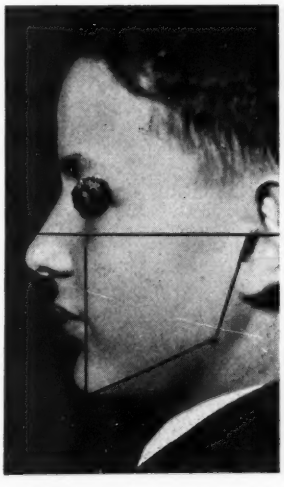


Fig. 3.

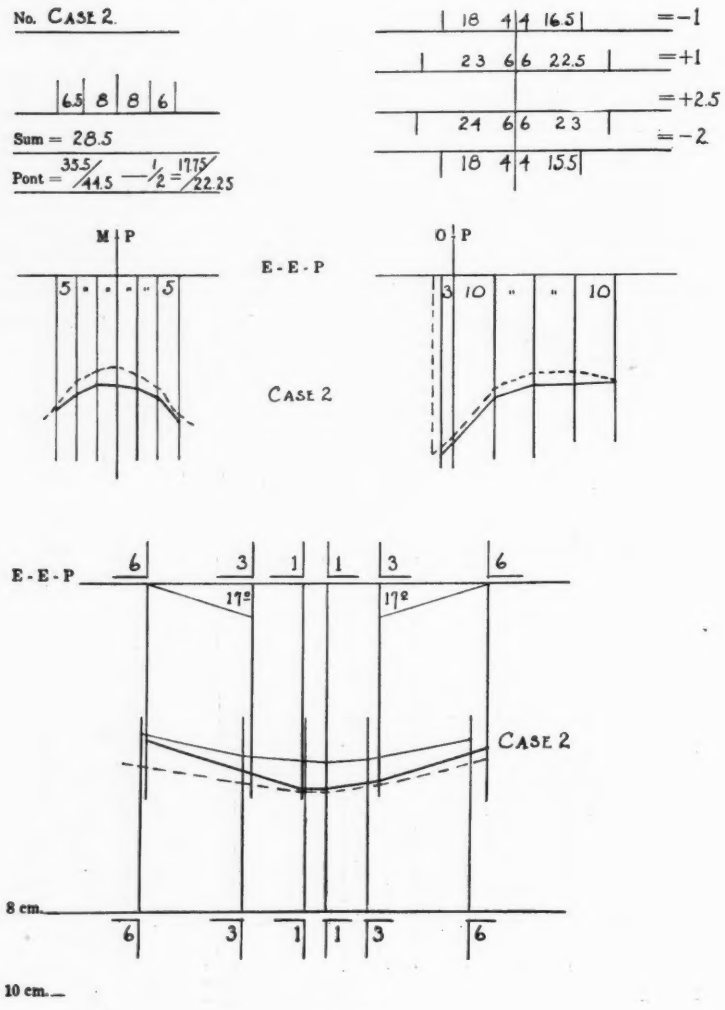

No. CASE 2.
6.5 8 8 6
Sum = 28.5
Pont = 35.5/44.5 — 1/2 = 17.75/22.25
18 4 4 16.5 =-1
23 6 6 22.5 =+1
=+2.5
24 6 6 23 =-2
18 4 4 15.5
M P
5 " " " 5
E-E-P
CASE 2
O P
3 10 " " 10
E-E-P
6 3 1 1 3 6
17°
17°
CASE 2
8 cm.
6 3 1 1 3 6
10 cm.

Fig. 4.

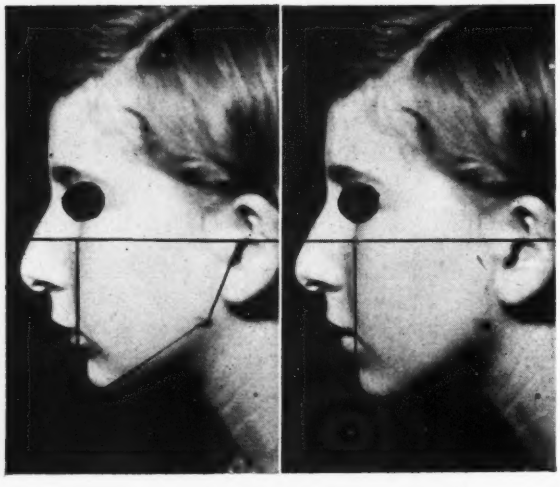


Fig. 5.

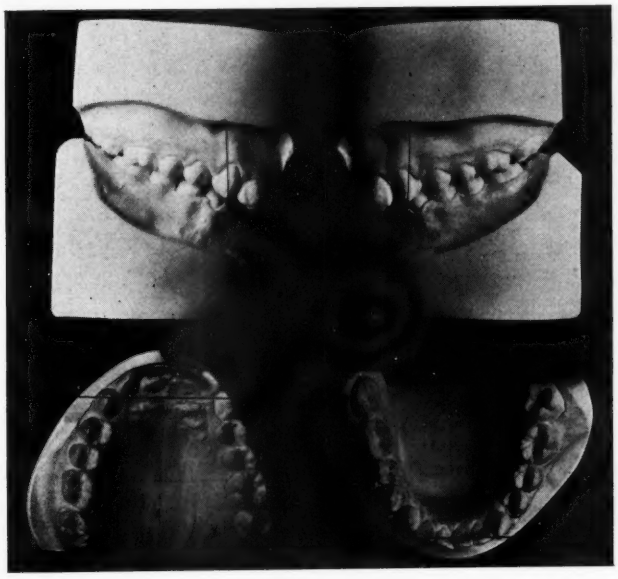


Fig. 6.

Fig. 7.

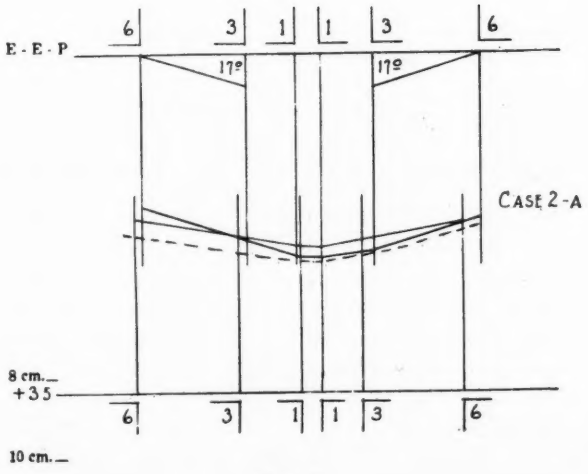


Fig. 8.

mandibular dental arch and its alveoli on the mandibular base, a procedure which presents perhaps unyielding difficulties. In an era which has been notable for its partisan devotion to standardized treatment appliances, we are prone to ignore the major, inherent deviation presented by this case, namely, the total dental and alveolar retraction in the mandible. My personal experience has convinced me that this anomaly presents one of the most difficult deformities which an orthodontist is ever called upon to correct. The prognosis, in my humble opinion, is very unfavorable and compels a longing for better methods of treatment.

CASE 2.—Female, age twelve years (Figs. 4-8).

Differential diagnosis—

A.—Maxil'a: *Contraction,* mild, asymmetrical, anterior dental, + mild asymmetrical, posterior, dental *distraction.*

Mandible: *Contraction,* mild, asymmetrical, anterior, dental, + mild, asymmetrical, posterior, dental *distraction.*

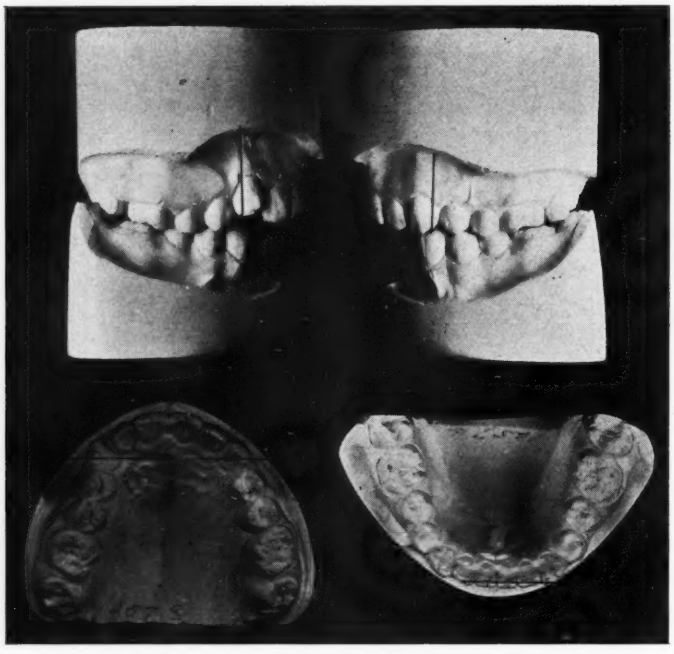


Fig. 9.

B.—Maxilla: *Retraction,* mild, symmetrical, incisal, dental;

Mandible: *Retraction,* (1/1), asymmetrical (right >) total mandibular, vertical.

C.—Maxilla: *Abstraction,* medium, asymmetrical incisal, + medium asymmetrical, posterior *attraction;*

Mandible: *Attraction,* medium, symmetrical, total mandibular.

Prognosis.—The major lesion in this deformity is the arrested development of the mandibular rami (compare the distance tragiongonion, on the photostatic photo, Fig. 5, with the distance goniongnathion). Fortunately, the radiograms reveal developing mandibular third molars, which promise developmental demands for the mandible if it is liberated from its posterior position. In Fig. 7, the gnathostatic casts show inserted wax bites, which "raised the bite" 3.5 mm. and permitted a more anterior, or frontal, position of the gnathion, as demanded by the facial profile (Fig. 5). An occlusal graph of the casts in this position is shown in Fig. 8, which may be compared with the graph shown in Fig. 4; the latter was made in the usual manner with the casts in natural occlusion. Would the correction of arch-width, as demanded by the deviations from the raphe-median plane (Fig. 4) and

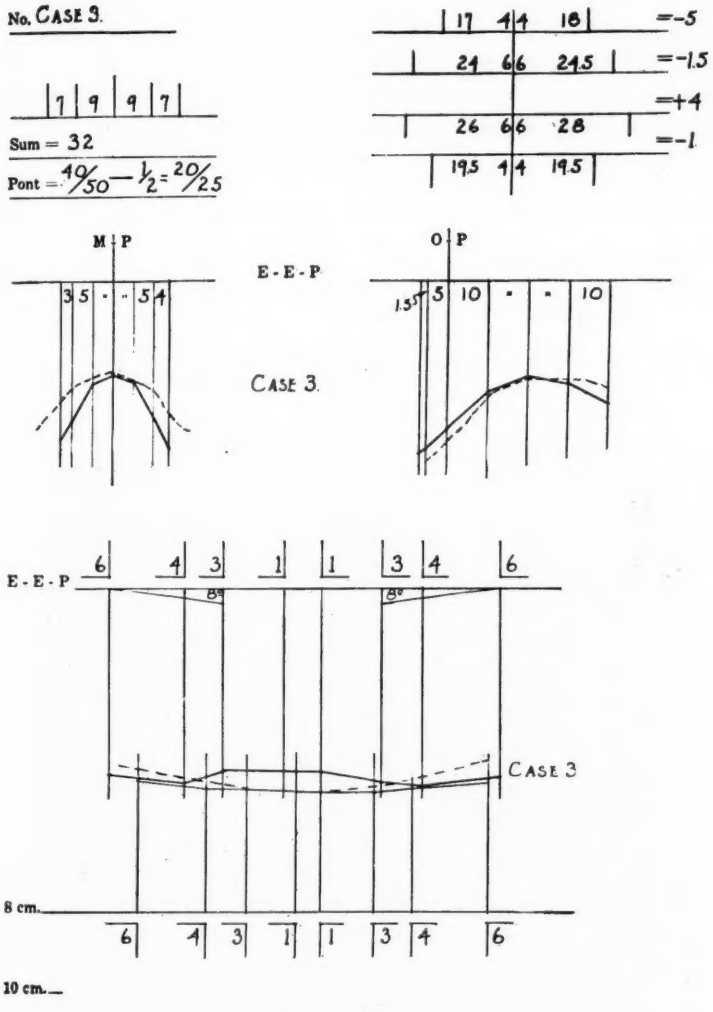

No. CASE 3.
7 9 9 7
Sum = 32
Pont = 40/50 − 1/2 = 20/25
17 4 4 18 =-5
24 6 6 24.5 =-1.5
=+4
26 6 6 28 =-1
19.5 4 4 19.5
M P
3 5 5 4
E-E-P
CASE 3.
O P
1.5 5 10 10
E-E-P
6 4 3 1 1 3 4 6
8°
8°
CASE 3
8 cm.
6 4 3 1 1 3 4 6
10 cm.

Fig. 10.

Fig. 11.

a prolonged maintenance of a forced forward position of the mandible promote a more vigorous and full development of the rami and an accomodation of the mandibular third molars? Will our ability to master and control these requirements affect the prognosis?

This kind of malocclusion is also known as a Class II, Division 2, but it is obvious that the anomaly is not the same as in Case 1. Dr. Federspiel suggested the term mandibular retroversion some years prior to the introduction of gnathostatic methods.

CASE 3.—Male, age seventeen years (Figs. 9, 10, 11).

Differential diagnosis—

A.—Maxilla: Contraction, anterior medium, posterior mild, asymmetrical, lateral, alveolar;

Mandible: Distraction, mild, asymmetrical, posterior dental.

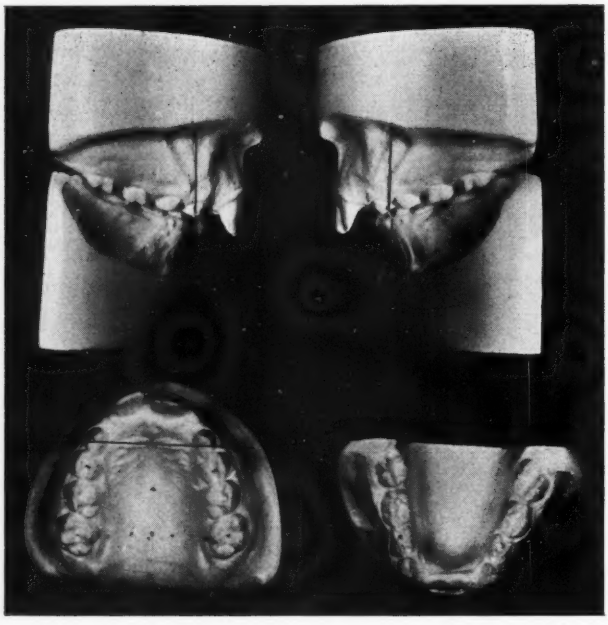


Fig. 12.

B.—Maxilla: _ _ _ _ _ _;

Mandible: Retraction, (1/1), symmetrical, total, mandibular, horizontal.

C.—Maxilla: Attraction, extreme, asymmetrical, anterior + posterior abstraction;

Mandible: Abstraction, medium, asymmetrical, total, mandibular.

Prognosis.—The retraction in this instance is due to an arrest of development in the body of the mandible, which the posterior position of the gnathion and the relatively short distance from gnathion to gonion disclose (Fig. 11). The long rami (tragion-gonion) explain the posterior abstraction in the maxilla and total abstraction in the mandible. Nutritional disturbances during infancy, as recorded in the patient's history and which the hypoplastic enamel in the molars confirms, may account for this deformity. But be that as it may, it undoubtedly is more than a mere "malocclusion of the teeth," demands a longer period than usual for correction and presents unpromising conditions for effective posttreatment maintenance. The second mandibular molars have but recently erupted, and it is doubtful when the third molars will erupt. But until they do, the mandible will probably not reach its maximum development. This case offers enough difficulties to satisfy the most enthusiastic orthodontist; and what the end-results would be if the patient were to entrust his anomaly to

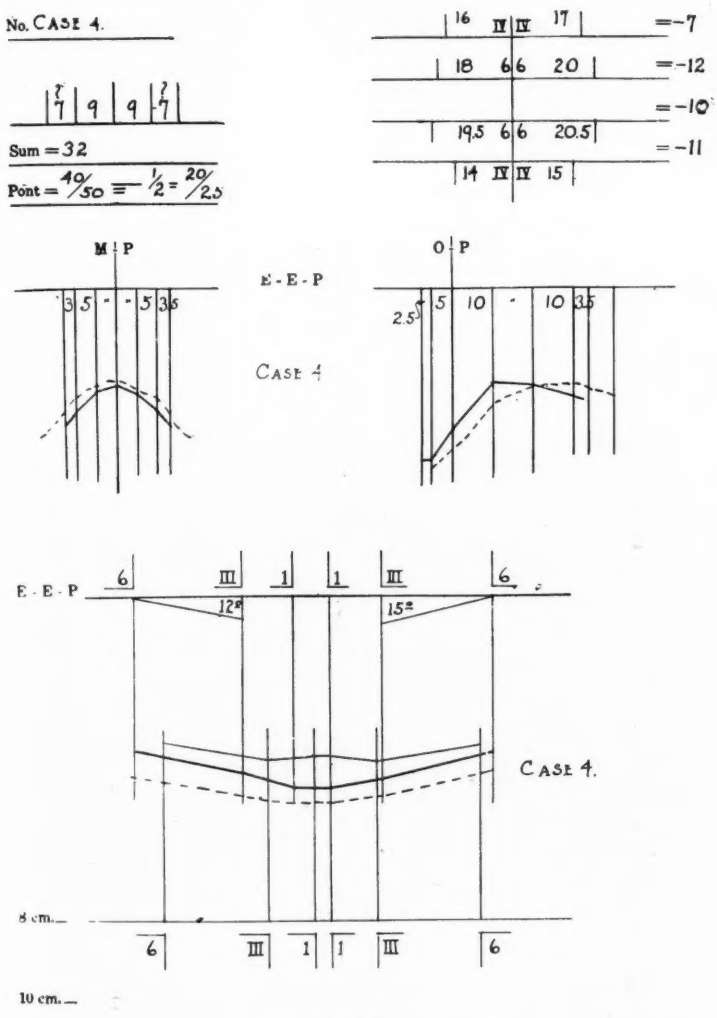

No. CASE 4.
Sum = 32
Point = 40/50 = 1/2 = 20/25
16 IV IV 17 =-7
18 6 6 20 =-12
=-10
19.5 6 6 20.5 =-11
14 IV IV 15
M P
E-E-P
CASE 4
O P
E-E-P
CASE 4.
8 cm.
10 cm.

Fig. 13.

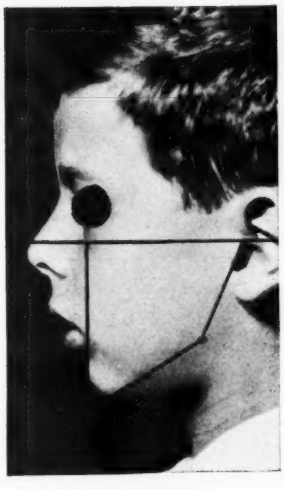


Fig. 14.

a general practitioner who dispenses laboratory-made appliances constructed by technicians who never see the patient (such as are advertised in most of our journals) I hesitate to consider.

CASE 4.—Male, age eight years (Figs. 12-14).

Differential diagnosis—

A.—Maxilla: *Contraction,* extreme, asymmetrical, total, alveolar;
Mandible: *Contraction,* extreme, asymmetrical, total, alveolar.

B.—Maxilla: *Protraction,* mild, symmetrical, incisal, dental;
Mandible: *Retraction,* (1¼/1¼), symmetrical, total, mandibular.

C.—Maxilla: *Abstraction,* medium, asymmetrical, incisal;
Mandible: *Attraction,* medium, asymmetrical, incisal.

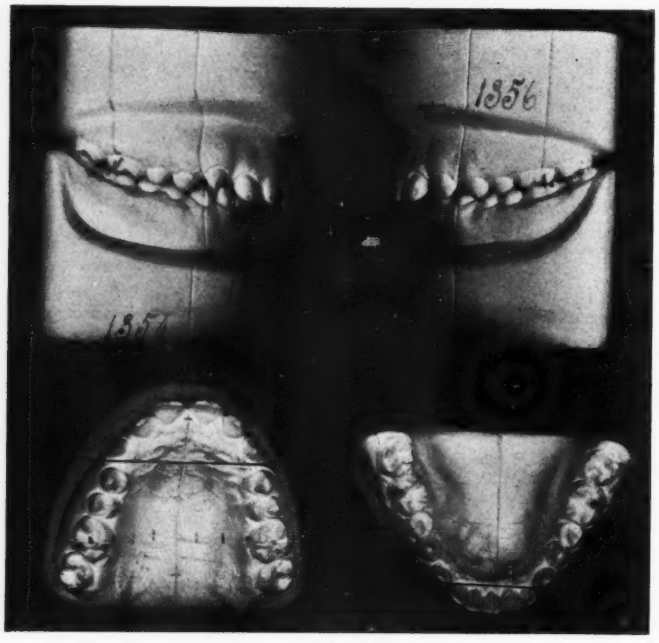


Fig. 15.

Prognosis.—This case presents a clinical picture familiar to all orthodontists, and the history is in substance as follows: Parents have normal dentures, the child was entirely bottle fed during infancy, no pacifiers were used, the child had frequent attacks of colds, adenoids and tonsils were removed twice, prior to orthodontic consultation. Walking started at nine months, deciduous teeth began to erupt at six months and the permanent teeth at six years. The extreme, bimaxillary, alveolar contraction is equally as noteworthy as the total mandibular retraction. A correction of the former is an immediate requirement and will aid materially in partially relieving the mandibular retraction. Muscle exercises, as recommended by Rogers, are very helpful in cases of this kind. Posttreatment observation and control must be continued until all the deciduous teeth are lost and their permanent successors have erupted. Periodic radiographic examinations of the mandibular third molars at a later age is also imperative, and their extraction is contraindicated. Their developmental influences and space requirements are factors worthy of consideration. I formerly termed this kind of anomaly micromandibular deformity, which term was adopted by this society at the meeting in Excelsior Springs in 1917.

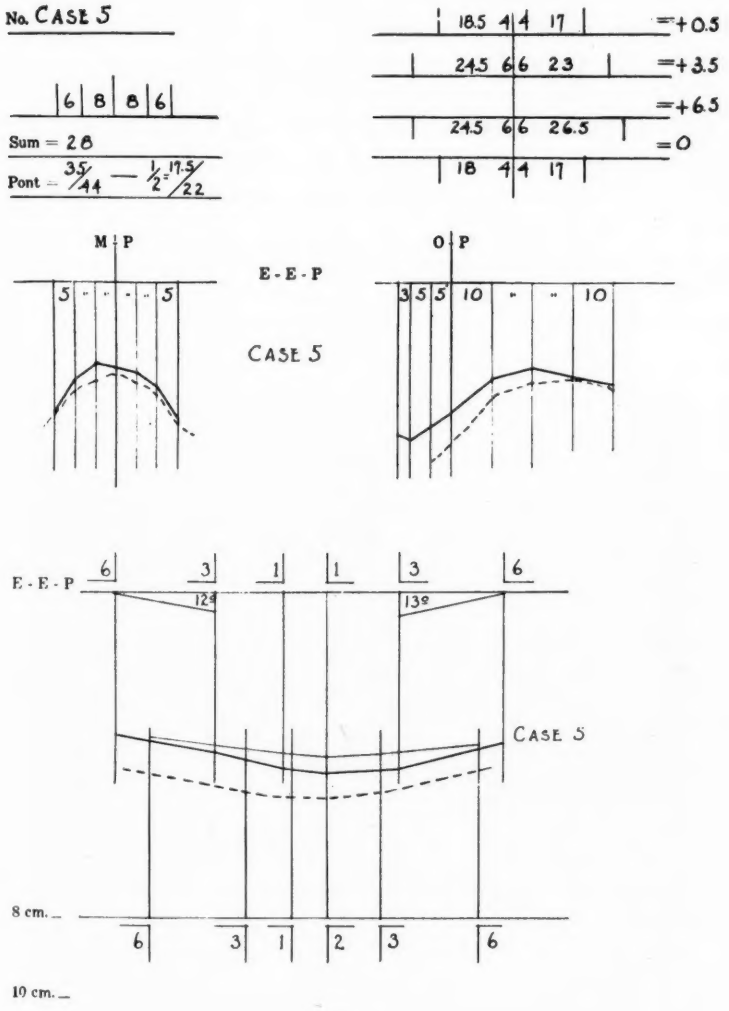

No. CASE 5
6 8 8 6
Sum = 28
Pont = 35/44 — 1/2 = 17.5/22
18.5 4 4 17 =+0.5
24.5 6 6 23 =+3.5
=+6.5
24.5 6 6 26.5 =0
18 4 4 17
M P
5 " " " " 5
E-E-P
CASE 5
O P
3 5 5 10 " " 10
E-E-P 6 3 1 1 3 6
12°
13°
CASE 5
8 cm.
6 3 1 2 3 6
10 cm.

Fig. 16.

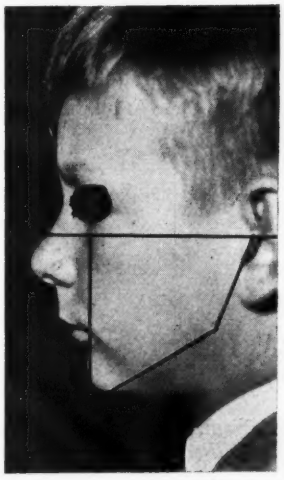


Fig. 17.

CASE 5.—Male, age eleven years (Figs. 15-17).

Differential diagnosis—

A.—Maxilla: *Distraction,* mild, asymmetrical, posterior, dental;
Mandible: *Distraction,* medium, asymmetrical, posterior, alveolar.

B.—Maxilla: *Protraction,* medium, symmetrical, anterior, dental;
Mandible: *Retraction,* (1/1) symmetrical, total, mandibular, vertical.

C.—Maxilla: *Abstraction,* mild, asymmetrical, anterior, alveolar;
Mandible: _ _ _ _ _ _.

Prognosis.—This case reveals that not all cases of so-called distoclusion, or mandibular retraction, are associated with contraction of the maxillary arch. This factor prompted me to include this case in this series, because a widening of the dental arches is contraindicated.

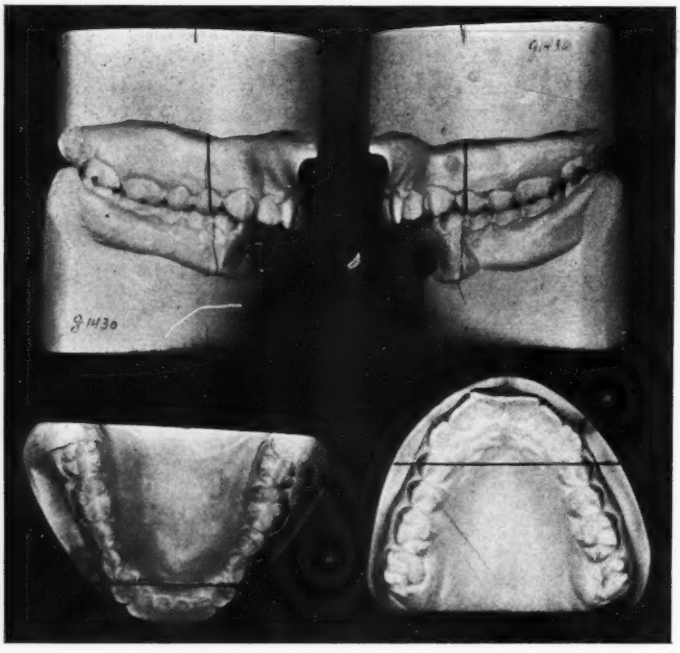


Fig. 18.

Another noteworthy feature is the supernumerary mandibular incisor. The father of this boy is a rhinologist and relates that enlarged tonsils were removed at ten years.

An incisal dental protraction in the maxilla, associated with mandibular retraction, usually presents a favorable prognosis. In cases of this kind orthodontic correction is usually successful.

CASE 6.—Male, age fourteen years (Figs. 18-20).

Differential diagnosis—

A.—Maxilla: *Contraction,* medium, asymmetrical, total, dental;
Mandible: *Contraction,* mild, symmetrical, lateral, alveolar.

B.—Maxilla: *Protraction,* (1/¾), asymmetrical, total, alveolar, right >, left <;
Mandible: _ _ _ _ _.

C.—Maxilla: _ _ _ _ _;
Mandible: *Attraction,* medium, symmetrical, anterior, alveolar.

Prognosis.—This case, though it presents a seeming bilateral distoclusion, exhibits a normal mandible. The sagittal deviation is confined to the maxilla, which discloses a total

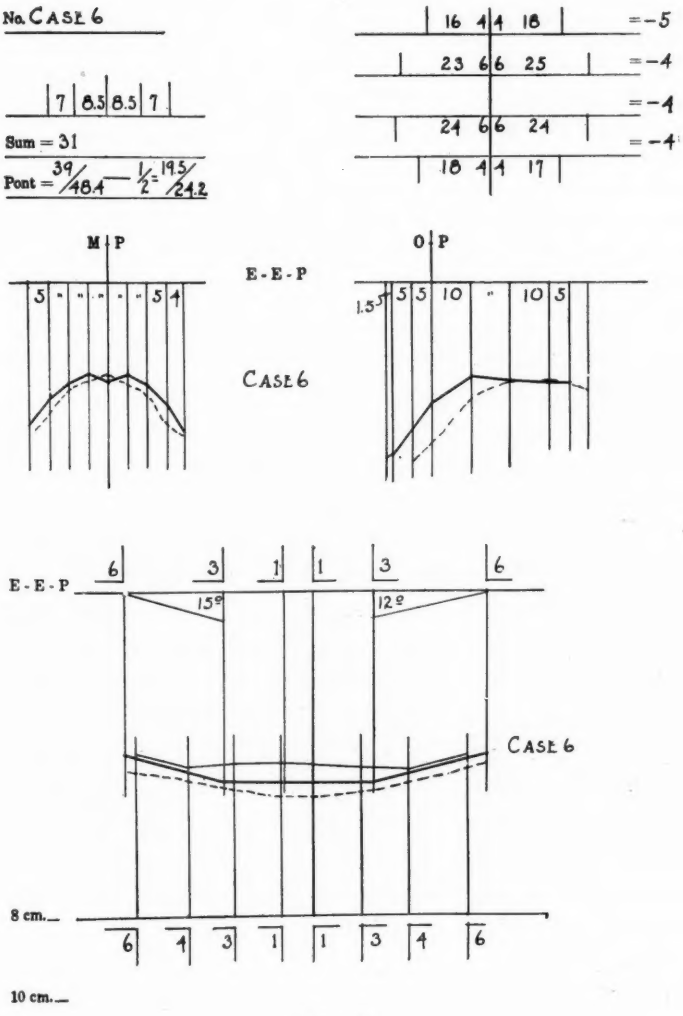

No. CASE 6
7 8.5 8.5 7
Sum = 31
Pont = 39/48.4 — 1/2 = 19.5/24.2
16 4 4 18 = -5
23 6 6 25 = -4
= -1
24 6 6 24 = -4
18 4 4 17
M P
5 5
E-E-P
CASE 6
O P
1.5 5 5 10 10 5
E-E-P
6 3 1 1 3 6
15°
12°
CASE 6
8 cm.
6 4 3 1 1 3 4 6
10 cm.

Fig. 19.

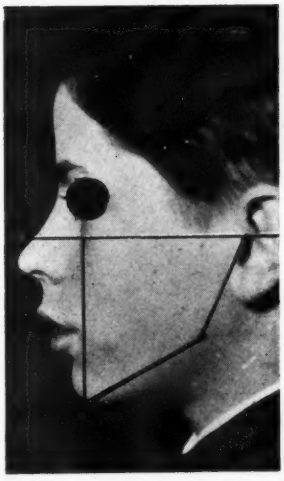


Fig. 20.

dental and alveolar protraction. The radiograms reveal four third molars in process of development. The transverse palatal curve is unusually wide, which is pathognomonic of a maxillary protraction. The gnathion lies in the orbital plane, while the subnasion is too far to frontal. The perpendicular position of the maxillary incisors, at right angles to the horizontal plane, also connotes an alveolar protraction. A posterior movement of the entire maxillary denture is an impractical if not impossible procedure in view of the presence of third molars. The anterior, or frontal, movement of the mandibular half of the denture would probably fail, because it would be an attempt to fit a normal mandibular denture to an abnormal maxillary denture. It is my belief that all orthodontists of experience have met with failures in the treatment of cases of this kind. I know of no better way to detect such deviations in advance of treatment than the methods I have employed in the differential diagnosis of this case.

Many more cases could be presented but enough have been shown in the time at my disposal and the reasonable limits of graphic illustration to demonstrate the very inadequate differentiation of intraoral occlusal methods of diagnosis. I am not unacquainted with the latter, after using them daily for over a quarter of a century. During the last four years I have applied gnathostatic methods as a daily routine (frequently in conjunction with the older methods), and I am convinced of their superiority.

I have purposely omitted illustrations of cases of so-called neutroclusion complicated by mesioversion of the maxillary molars and premolars, which I differentiated from distoclusions several years prior to the introduction of gnathostatics. By using these methods the differentiation of these is materially simplified.

In conclusion, I gladly acknowledge that orthodontics achieved many fine technical advances and acquired a fairly well equipped armamentarium during the period of intraoral diagnoses. But if we are striving for greater clarity, for a finer differentiation in our methods of diagnosis, for more efficient methods of treatment, for a reduction in the number of our failures, we ought to face the problems of diagnosis frankly and sympathetically, in a spirit that will not decline to interpret dental anomalies in a more comprehensive manner.

TREATMENT OF CLASS II OR DISTOCLUSION*

By C. A. Hawley, D.D.S., F.A.C.D., Washington, D. C.

FOR a comprehensive understanding of our status in the treatment of Class II, or distoclusion, we must briefly review the history of the treatment of this class. As a preliminary, it must be said that while Class II is not the greatest in number of the cases met with in the practice of orthodontia, yet its successful treatment is probably the most difficult of any that comes under the orthodontist's care, and his success and reputation are more dependent upon its successful outcome than all the other cases combined. One reason is that the facial deformity caused by these cases is greater than in any other class, and consequently the improvement attending successful treatment attracts greater attention.

The time allotted me for this paper makes it impossible to quote largely from the literature to sustain many of the statements made in this review, but the history of the subject is so well known that I will need only to refresh your minds in a brief summary.

I wish first to call your attention to Dr. Kingsley's method of treatment of this class by what was called "jumping the bite." The operation was accomplished with a bite plane. In this method no movement of the teeth in their alveoli was made or attempted; the action of the bite plane simply compelled the mandible to move forward. In many cases this method was successful, but in a great many the mandible was brought so far forward that the facial results were unfavorable, and, besides, it could not be maintained in this position. The failure in these two respects led to search for a better method of treatment that would eliminate failure in such cases. The extraction of the maxillary premolars then came into practice, the six anterior teeth being moved backward and the spaces closed. As the mandible was not disturbed in this method of treatment and the prominence of the anterior maxillary teeth was reduced, this treatment was successful in those difficult cases where Kingsley's jump-bite method was a failure. Angle's first book advocated this method, and his first appliances were designed and used for its accomplishment. The head cap for occipital anchorage was here introduced and was a necessary adjunct to this operation.

With the introduction of the so-called Baker anchorage, methods of treatment of this class again changed. No longer was it necessary to extract the maxillary first premolars because it was believed that where indicated the whole maxillary arch could be moved backward as well as the mandible forward. The technic of the management of the maxillary appliance was worked out for that purpose. In those cases where this movement was desired, the arch bar was placed above the gingival line of the incisors and kept free from

*Section of symposium on apparent distoclusion read at the Twenty-eighth Annual Meeting of the American Society of Orthodontists, Estes Park, Colorado, July 15-20, 1929.

actual contact with them, the nuts in front of the molar tubes were kept tight, and intermaxillary rubbers or Baker anchorage used. This force tipped the first molars backward as the nuts in front of them were tightened more and more. Finally the arch bar was ligated to the incisors and premolars, and with the widening of the arch the prominence of the incisors lessened. Continued use of the intermaxillary rubbers with skillful manipulation of these forces made it possible to move all the maxillary teeth backward and was a recognized practice where it was deemed necessary to reduce the extreme prominence of the maxillary incisor and canine teeth.

At the meeting of the American Society of Orthodontists in Chicago in 1905, Dr. Angle read his famous paper entitled "The Upper First Molar as a Basis of Diagnosis in Orthodontia." The contents and claims of that paper are so well known that it is unnecessary for me to quote specific extracts. The claim was broadly made that, except when disturbed by mutilation, the first maxillary molars were always developed in their correct position in the skull, and therefore in treatment, except as a temporary expedient, it was unnecessary to move them and the rest of the teeth backward. The widening of the maxillary arch in the premolar region would allow the retraction of the incisors sufficiently, and with this modification the maxillary teeth would always be correct and the final result on the facial lines would universally be the best that could possibly be obtained. The mandible must be brought forward to correspond to this position of the maxillary teeth.

This pronouncement was not received without protest. As an example, I will quote from the discussion of Dr. Watson, one of his most experienced students. In the discussion of Dr. Angle's paper, he said, "In the correction of the first division of Class II, I take it Dr. Angle would confine the movement in the molar and bicuspid region entirely to the lower teeth; for if the upper molars erupt in their normal mesiodistal relation to the face, that would be the natural treatment. Now, I have at times treated cases of the first division of Class II where I would not have dared to resort to such practice."

Notwithstanding a few such protests, this pronouncement of Dr. Angle's was generally adopted by his students and by American orthodontists generally. From that time on we find no discussions of methods of manipulation of appliances to move maxillary molars or maxillary teeth backward. It seems from that time on to have become a lost art, or obsolete. Occipital anchorage also became obsolete. Where in the proceedings of the American Society of Orthodontists from that time on do we find papers or clinics on the art of moving the maxillary teeth backward?

I recognize, of course, the almost universal use of intermaxillary elastics, but I submit that these have been universally used to develop the mandible, and there has been little design or expectation of moving the maxillary teeth backward. If they are developed in their normal position in the skull, such practice would be wrong and unnecessary.

Outside Dr. Angle's students and the members of the American Society of Orthodontists, this theory of the universal normal development of the max-

illary first molars met strong opposition. Case, a man of great experience, keen observation and a master of the art of orthodontia, always bitterly opposed it. Cryer, one of America's most eminent anatomists, opposed it most decidedly. In Europe while the predominence of American orthodontia rather forced its acceptance as a matter of course, the anthropologists and anatomists strongly questioned it.

Van Loon, about 1915-1916, entered into a series of investigations which absolutely disproved that the first molar developed into a fixed position in the skull. His apparatus, though conclusive for scientific investigation, was not adapted to routine office practice. Simon, inspired by van Loon's results, developed an apparatus much simpler and well adapted to office practice, the results of which have been fully described in his paper read before this Society in 1924 and in his book, translated by Dr. Lischer. The conclusions on this subject that have been crystallizing through Europe have been epitomized by Mr. George Campion in a discussion of a paper on Class II by Dr. D'Alise of Paris, which I quote: "He asked them to take those cases of postnormal occlusion (what Angle called Class II), there were four possibilities in any one of those cases: first, the malocclusion of the teeth might be the result of the maxilla being too far forward; in the second place it might be the result of the teeth in their sites and sockets in the maxilla being too far forward; the third possibility was that the mandible might be as a whole too short, and, consequently, the whole of the lower arch too far back; and the fourth possibility was that the mandible might be normal in size but the lower arch of the teeth might be too far back in the mandible."

While the conclusions represented in this quotation have been steadily growing in Europe, American practice in the main has still clung to a practice and technic based on Angle's conception of the normal stability of the first molar.

In the December, 1928, issue of the *Dental Cosmos,* Dr. Angle started a series of articles entitled "The Latest and Best in Orthodontic Mechanism." These articles are continued in the March and April, 1929, numbers. It is not within the confines of this paper to discuss the main subject of the paper, the new mechanism, but in the March number he discusses the principles of treatment in these words: "The modern correct treatment of these cases (i.e., Class II) demands the pronounced distal movement *en phalanx* of the teeth of the upper arch in order that they may be in fully normal cusp relationship with those of the lower arch. This should be done without mesial movement of the lower teeth (even though intermaxillary anchorage be employed) and without mesial displacement of the mandible from the normal habitual relations on its condyles in the glenoid fossae as manifest in the act of swallowing. The importance of avoiding mesial displacement of the mandible in the treatment of these cases has been ably emphasized by Dr. Cecil B. Steiner in a paper recently read before this Society and soon to be published."

Further on in the paper, to accentuate this view of treatment, he says of anchorage, "With the tremendous progress that has been made in gaining effective anchorage it would seem that occipital anchorage could now be

entirely dispensed with, as I once believed possible. But I am convinced that in very complicated cases, such as often tax the skill and ingenuity of the orthodontist, the head gear, traction bar and heavy elastic bands always have a place as an anchorage auxiliary and should be used promptly when indicated or before the usual anchorages have been impaired or become exhausted."

The question naturally arises: Is this treatment "new and modern" as claimed, except for the appliance, or is it a complete repudiation of the pronouncement on the normal position of the upper first molar in 1905 and a return to the principles of treatment before that time even to the use of occipital anchorage?

In comment on this statement on the forward movement of the mandibular teeth and mandible, is it possible that *all* our treatment on that basis in the last twenty years has been wrong? Some of it has been, no doubt, but the tremendous number of successful cases treated in this manner made it unlikely that so extreme a statement can be true. The position is as wrong as was the statement in 1905 that the upper first molar was always in the correct position in the skull.

This brings us clearly to the realization that a correct differential diagnosis must be made as advocated by Dr. Simon and the treatment must be guided by the conditions found. Routine treatment, consisting of widening the arches and developing the mandible forward without considering the position of the maxillary teeth in the skulll under the assumption that the best results in the face will be thereby attained, is not the best that can be obtained in orthodontia. The study of the face and head must come back into orthodontia, not as a routine method of showing results by routine methods, but as a necessary guide in diagnosis and as a vital requirement. Dr. Case was right in insisting on the necessity of a study of the face in diagnosis, although his method of study by facial casts is much improved in the use of photostatic photographs.

While not strictly included in the subject of this paper, I wish to say a word in regard to the orbital line, or canine law, in diagnosis, and advise caution in its strict application. It is undoubtedly subject to much variation, as pointed out by Hellman, and others. It must be remembered, however, that practically all the investigations of its critics have been carried out on skulls where a study of the variations in their relation to the profile is impossible. My own judgment, after four years' use, is that as a fiction it is the most valuable one we have. I find that where the shape of the head is fairly uniform and the face straight, as in the examples in Figs. 1, 2, 3, 4 and 5, the orbital line falls through the canine. Where there is a variation it is shown in the face. Yet I must confess I am puzzled to explain some cases. Fig. 6 shows two faces of this kind, and Fig. 7 the models. It will be seen in these faces that the orbital dotted line drawn through the gonion and Chielion, carry the eye-ear plane far above the ear point—yet they are apparently well balanced faces. In the models it will be noted that the orbital line falls through the lateral incisors. Notwithstanding these puzzling exceptions, I

find the study of the orbital line much more useful and valuable than the old line of Apollo or that state of mind sometimes called a "hunch." We must have some landmarks to start from even in so variable an object as the human head, and I have found none open to as few objections as the eye-ear plane and orbital line. Used with discretion and good judgment they form a very valuable basis for comparison in diagnosis.

Fig. 1.

Fig. 2.

As a second part of my paper I wish to show a few treated cases and discuss my experience in the treatment of maxillary protraction.

In 1921 I became discouraged in the treatment and retention of certain types of Class II cases. This type is what we would now call maxillary protraction, i.e., cases where the mandible is apparently in its normal position and the maxillary teeth are too far forward in the skull. Fig. 8 shows models of a case of this type which was presented to me in September, 1921. I concluded from a study of the models and the face that in this particular case the mandible was in its normal position and that the maxillary teeth were

too far forward. You will note in the models before treatment, that the maxillary canine teeth are slanting forward. This, in my judgment, is an important point in diagnosis. This illustration shows the models before treatment, patient at the age of thirteen years, about eight months after treat-

Fig. 3.

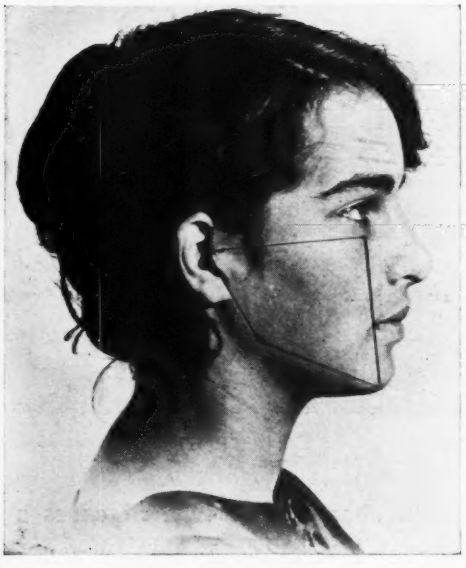


Fig. 4.

Fig. 5.

ment at the age of fourteen years and after three years' retention at the age of seventeen years. The final models at the age of seventeen years are gnathostatic models, as at that time I had adopted Simon's method of diagnosis, and you will note position of the orbital line. Fig. 9 shows the face before and after treatment, and Fig. 10 the profile before and after treatment. In study-

Fig. 6.

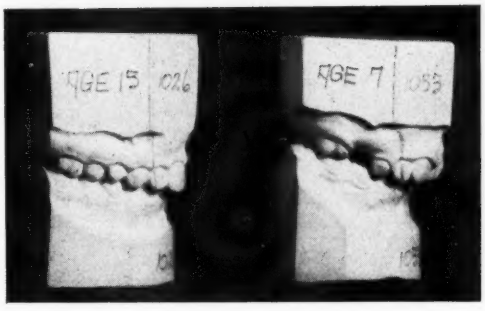


Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

ing the profile before treatment you will see that the mandible is well developed and in good relation to the rest of the face.

One year later, in September, 1922, I had another case presented for treatment of the same type. The former case was so satisfactory to the patient and all those interested that I decided to adopt the same treatment for this case, the models of which are shown in Fig. 11. You will note a very similar condition here, although the canines are not inclined forward quite so much. The illustration shows the models before treatment, two years later and again three years later. Fig. 12 shows occlusal views of the models before and after treatment. Fig. 13 shows the profile before and after treatment.

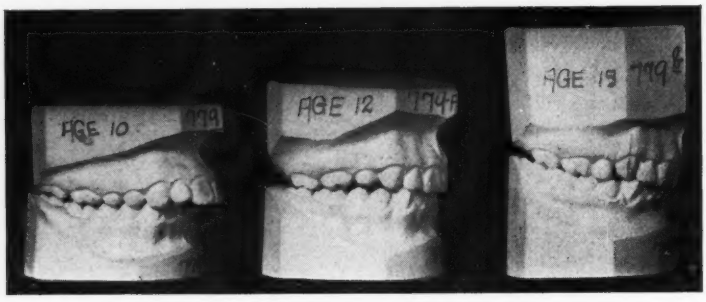


Fig. 11.

Fig. 12.

In this profile before treatment you will note again the well-developed mandible and its relation to the rest of the face. Fig. 14 shows the front view of the face before and after treatment.

I may say here that from the standpoint of satisfaction of the patients and those interested in them, and from the stability and permanence of retention, these two cases were and have remained to this time among the most satisfactory I have ever treated. I believed at the time these cases were treated that it was impossible to move the maxillary denture backward, even at this early age, and I had had many failures in retention where these cases were treated by the method of widening the arches and attempting to carry the mandible forward. After a few years the mandible gradually would recede to its former position and, while the patient would close the teeth nor-

mally when told, yet in conversation and mastication the mandible generally would recede to its old position.

Fig. 15 shows a case presented in 1925, in not so aggravated a type. In this case I decided to attempt the treatment by moving the maxillary teeth backward bodily. You will note the position of the orbital line in the models before treatment. I wish to say here parenthetically that whatever may be the variation of the orbital line, in different cases experiments by myself and others in taking models of the same patient at varying periods of time, show that as a means of measurement of the movement obtained during treat-

Fig. 13.

Fig. 14.

ment, this method is accurate. No other method has ever been devised by which the movement obtained in the mouth by measurement from a point entirely outside the denture can be made. Of course, you have the problem of growth during the years of treatment, but my own opinion is that this is so slight as not to invalidate this method as a means of accurate measurement of movement obtained. This case was treated with occipital anchorage, and I believe the models show that I succeeded in moving the maxillary denture backward. Fig. 16 shows the occlusal view of the models before and after treatment. You will notice that the 2 cm. line drawn back of the orbital line in the model before treatment passes through the body of the first molars; after treatment it passes through the mesial surface of the molars, showing

that they have been moved bodily backward. Fig. 17 shows the front view of the face and Fig. 18 the profile. This case has been retained successfully for three years, and there is no indication whatever of a change in the posi-

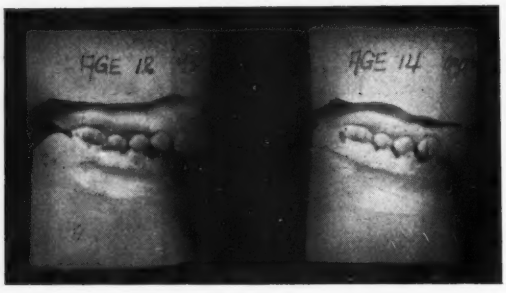


Fig. 15.

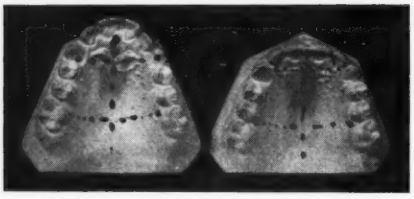


Fig. 16.

Fig. 17.

Fig. 18.

tion of the teeth. The fear that the developing second and third molars would again force the maxillary denture forward seems to be unfounded.

Fig. 19 shows models of a case of the same nature treated in the same way. In this case occipital anchorage was used but assisted by intermaxil-

Fig. 19.

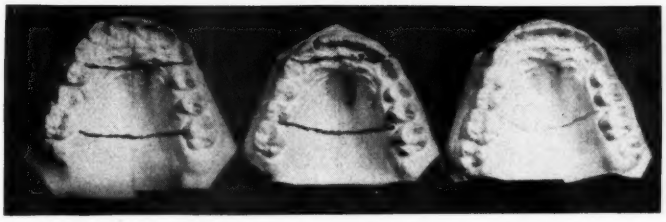


Fig. 20.

Fig. 21.

Fig. 22.

lary rubbers. Here, again, I believe that I moved all the maxillary teeth backward. The models in Fig. 20 are shown of patient at the ages of nine, ten and twelve years. In the models after treatment, at the ages of ten and twelve years, there is no change in the position of the orbital line. Fig. 20 shows occlusal views before treatment, and two models after treatment at the ages of ten and twelve years. If you note the position of the 2 cm. line back of the orbital in the case before treatment, you will see that it passed through the middle of the first molar teeth; after treatment it passed through the mesial surface, showing these were moved backward about the width of the premolar tooth, and a year later it had not changed. Fig. 21 shows the face of this patient before and after treatment and Fig. 22 the profile. This condi-

Fig. 23.

Fig. 24.

tion existed even in the deciduous denture as shown by Fig. 23, photographs of the child at three years of age. I have never treated a case in my twenty-five years' experience that has been so satisfactory from the standpoint of retention, as this case. There is no doubt that the mandible moved forward slightly during this time, but there has been no tendency whatever, so far as I can see, to a change of the mandible or any movement forward of the maxillary denture.

In the same year, 1925, I treated another case by the same method, patient at the age of twelve years. Again the occlusal models, Fig. 24, show evidence that the maxillary denture was moved backward bodily even though the second molars were erupted. You will note the same landmarks as pointed out in previous cases, and the third model, in 1927, shows no evidence of forward-drifting maxillary teeth. The resultant stability of this movement

has completely surprised me and changed my opinion in regard to the possibility of this treatment.

I have shown you my earliest treated cases because in these I can speak of the satisfactory results and the stability of the retention. Since that time I have adopted this method of treatment in all cases of this character. It becomes a matter of very nice judgment and requires considerable experience to determine where treatment by moving the whole denture backward, and where treatment of this type of cases by removing the first premolars, should be used.

I confess that I cannot fix the age limit. Circumstances surrounding the case, the time at your disposal and careful study of photostatic photographs must determine your own procedure in these particular cases. After the age of sixteen years my tendency would be to remove the premolars, and, as some of you know, I have obtained very satisfactory results by this method, which I have not time to show in this paper.

In closing, I again wish to emphasize the necessity for careful differential diagnosis. I believe that the Simon method helps very much, but it must be supplemented by experience and other indications. I protest against the routine treatment of Class II as indicated under the assumption that the maxillary denture is always in correct relation to the skull. It is wrong and produces only lamentable failures in certain types of cases.

METHODS OF TREATMENT*

By Allen H. Suggett, B.S., D.D.S., San Francisco, Calif.

THE treatment of the case I am going to describe to you in no way differs from the treatment anyone of you would make use of in a similar case after you had made a diagnosis and knew just what you wanted to do. Therefore the gist of the problem is the diagnosis.

The gnathostatic model (Fig. 1, model 1) shows that the maxilla is approximately correct in relation to the head, as the orbital plane passes through the canines, and therefore should not be moved either forward or backward. However, the incisors are in retraction or linguoversion about 10 mm. so that the prosthion which should be 5 mm. forward of the orbital plane is 5 mm. distal to it. The incisors are in abstraction or too far from the eye-ear plane.

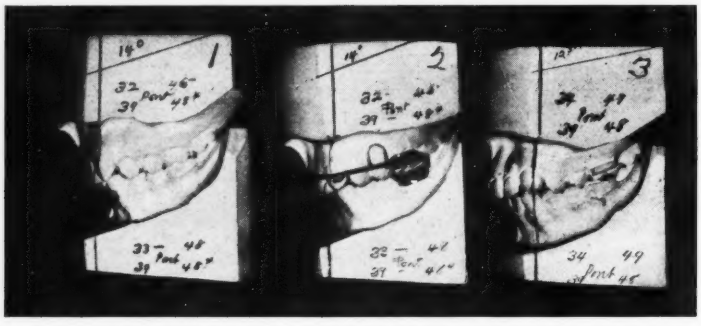


Fig. 1.

There is a total retraction of the mandible. The photostatic picture (Fig. 2) confirms this. There is a mild contraction of both maxillary and mandibular teeth as shown by Fig. 3.

According to this diagnosis the maxilla should not be disturbed in its sagittal position. A slight expansion is required, and the incisors should be moved forward and upward. The mandible should be expanded and moved bodily forward. Therefore, after making a diagnosis and discovering just what is to be done, to do it is very simple. I used a method perfectly familiar to all of you.

I selected this case which by the way, is not yet completed, because it presents about all the complications of this type of case. The maxilla is correct sagittally, but with contraction, and with a mechanical interference of the incisors, and the retracted mandible and rotated canine.

By attacking each problem scientifically, rapid progress was made and no time or motion was lost, as you will see when you note the progress that was made in five months.

*Read at the Twenty-eighth Annual Meeting of the American Society of Orthodontists, Estes Park, Colorado, July 15-20, 1929, as part of a symposium on "Apparent Distoclusion."

As the maxillary teeth were correct sagittally we did not want to disturb them except to move the incisors forward so the prosthion would be 5 mm. forward of the orbital plane. This was done with a labial 0.04 wire from molar to molar, with an 0.022 wire soldered, to which the incisors were ligated.

To give the forward force we attached a 0.02 wire spring (Fig. 1, model 2). This force carried the incisors to the correct position in about four months.

At the same time there was a lingual wire on both maxilla and mandible to create the required expansion. The lower wire carried a finger spring in the form of a switch back to move the incisors forward. The mandibular

Fig. 2.

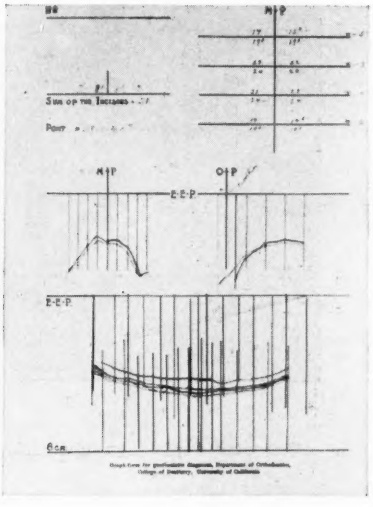


Fig. 3.

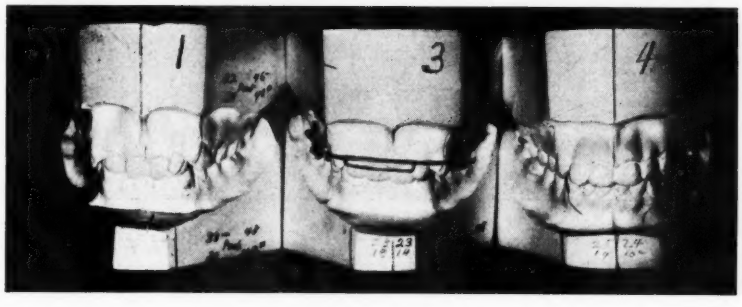


Fig. 4.

incisor followed the maxillary one forward. As soon as these incisors were corrected, we applied Baker anchorage, and the mandible moved forward with very little help. The patient was instructed to bite forward and force the teeth down into occlusion, a la Rogers. So with the help of Simon, Mershon, Rogers and a few others, we took this case on August 21, 1928, and changed it as shown in Fig. 1, model 3. This case is not yet completed, as you see.

You will note that the mandibular teeth are inclined forward. This can easily be corrected by using a model of the gay nineties which corrects them immediately (Fig. 6).

In describing to you our technic of treating a case of mandibular retraction, we are not laying any claim to special skill, for we are using methods familiar to all of you, but we are scientifically applying these well-known methods by making a correct diagnosis and deciding what we wanted to do before starting.

A gnathostatic diagnosis definitely shows us if the maxilla is correct sagittally and thus indicates whether or not it should be moved. We use the same methods of diagnosis to determine what we have done after the case is finished. As we use the same plane for our measurements before and after,

A *B*

Fig. 5.—Photostatic photographs. *A*, February 1, 1929; *B*, July 1, 1929.

Fig. 6.

we know what movements have taken place. To affirm that either maxilla or mandible has been moved without having gnathostatic models, before and after, is mere guesswork. Scientists are trying to get away from guesswork. Are we scientific?

DISCUSSION OF THE SYMPOSIUM ON APPARENT DISTOCLUSION PRESENTED BY DRS. LISCHER, HAWLEY, AND SUGGETT

Dr. James David McCoy, Los Angeles, Calif.—It is inconceivable to me how anyone privileged to hear this symposium can fail to realize the necessity for differential diagnosis in orthodontic practice. While the cases discussed and illustrated constitute what has heretofore been considered a distinct class of malocclusion, their analysis by means now available shows impressive differences which were not apparent when they were judged by our past

orthodox methods. That these discrepancies have not been more widely recognized can only be accounted for in the fact that most human beings are prone to continue to think and do things as they were first taught to do them. In fact many rebel at learning new methods if old ones seem satisfactory and have become more or less routine in their application. With many, this feeling assumes an aspect of intolerance, particularly if the change tends to upset the even tenor of their ways.

The dogma of the first permanent molar as a basis for classification and diagnosis was drilled into so many orthodontists in the making, that when the plan suggested by Dr. Simon was introduced, it received but slight recognition. Even today, comparatively few men, when we consider the great mass of practicing orthodontists, have investigated his plan of differential diagnosis with sufficient thoroughness to judge its merits. An appreciable number have openly condemned it without trial and have allowed their prejudices against it to develop almost to the point of rancor and bitterness. It would be interesting to conjecture what benefits would have accrued to these same men had they utilized this same energy in trying to understand the philosophy upon which the plan is based and in seeking out its helpful features rather than its alleged weaknesses.

In inaugurating any plan of treatment, we are called upon to determine more or less definitely the relationships we hope to establish in the denture and its adjacent and related structures. In diagnosis, therefore, we must first strive to determine the true state of the anomaly, its extent, and the various conjoining parts involved. An appraisal of the cases shown by our essayists is ample to demonstrate that this is not the simple matter we were once satisfied to consider it.

In times past, we have prided ourselves upon the information which could be gleaned from an accurately made set of casts of the denture. Without depreciating the value of such aids, I want to say that I never realized how inadequate they were when made after the old plan until I adopted gnathostatic methods. The old-fashioned plaster models, trimmed with meticulous care so that the occlusal plane is always parallel with the base of the lower model and without any means of identifying its position in the face, only tells part of the truth and frequently is very misleading. (Slides were shown.) Such a cast could belong to Tom or Dick or Harry, and it would make little difference for you actually view it as an isolated object. The same thing holds true of photographs which are not made photostatically with a technic which makes possible their subsequent accurate duplication in the same definite relationship and ratio of life size.

When we use gnathostatic casts we are immediately able to visualize the denture as it is in the particular face in which the anomaly is located. Its relationship to certain easily located planes is shown, and they are projected upon it in a way which is reasonably accurate. Combine such casts with the photostatic pictures and you establish a means of visualizing the anomaly in a comprehensive manner showing all its aspects and relationships.

The comforting part of it is, and this fact is not generally realized, that all this additional information is available by the new method with no more trouble or time spent than is necessary to make casts and photographs by the old method. When viewed from the standpoint of information gained there is no comparison. This can easily be verified by anyone who is willing to take a case of apparent distoclusion, make gnathostatic casts and photostatic pictures of it and also old-fashioned casts (and photographs if you will) and see which one gives you the most information.

Since adopting this helpful method in diagnosis, I have placed 123 cases under treatment. Of these, 64 were cases of apparent distoclusion. My study of them from the new viewpoint has proved both enlightening and decidedly helpful. Like anything else worth while, it takes some time to learn the method and to apply it with accuracy, but it is certainly worth while, and adds materially to the interest of our work.

Every orthodontist of experience realizes that good sound judgment is essential to all phases of successful practice whether it be diagnosis, the evaluation of etiologic factors, or treatment. It should be obvious, nevertheless, to any thinking person that any plan which makes it possible for an orthodontist to see an anomaly correctly, to judge its extent, to determine with a fair degree of accuracy which structures are involved and the approximate extent of their involvement, will place him in a better position to map out an intelligent

plan of treatment. Without such help how can we be expected to exert our best judgment? Even with such help our judgment is put to a severe test and not infrequently proves faulty.

These new methods have added one more link to the chain which has heretofore been missing, i.e., we are now able to determine with a reasonable degree of accuracy what we do to our cases when we treat them. If we disregard all the other helpful features which are available in gnathostatics, this one alone would be sufficient to place us under obligation to Dr. Simon. In our past clinical reports we have made many extravagant statements upon purely ocular evidence. We thought we had accomplished certain things, but we had no means of making dependable measurements. Now when we adopt a plan of treatment, we can tell how nearly we achieve our aims. Granting that errors creep in during the application of the measuring principles, still even a novice can see the vast improvement over our older methods. During the next few years a great deal of valuable evidence is bound to be accumulated which not only will have its effect in treatment but also will shed a much needed light upon prognosis.

I believe we are fast coming to realize that in a very large percentage of the cases we are called upon to treat, the problem involved is not adequately described by the term "malocclusion." In fact we are frequently dealing with dentofacial deformities, which in character are complex morphologic deviations, not only including the teeth and alveolar processes, but extending beyond those boundaries and involving the jaws and in many instances some of the external features of the face.

Have we been meeting the problem successfully? Certainly in the light of what has been shown here today our old methods of intraoral diagnosis are not adequate.

Drs. Hawley, Lischer, and Suggett have been untiring in their efforts in the past in demonstrating means which are proving helpful, and I for one am very grateful to them.

Dr. Harry E. Kelsey, Baltimore, Md.—The subject has been treated so ably by the three men to whom you have listened, to say nothing of the others who are also on the program to discuss it, that I would be wasting your time, unless I felt that I had substantial evidence to refute the position they have taken. I have no such evidence but am rather in a position of agreement with their conclusions and, therefore, shall occupy but a few minutes with my comments, which may perhaps express the attitude of not only myself but quite a number of other orthodontists with regard to the matter.

In the first place, I strongly approve of scientific methods in diagnosis and in treatment, and I believe that their methods are scientific. I believe that they are an aid to diagnosis and enable one to see in a case certain things which he would otherwise overlook.

I do not believe in the infallibility of what has been termed the canine law, that is, that the orbital plane always coincides with the position of the canine tooth in individuals who are normal in development. Yet it does so often enough to serve as a check on other diagnostic factors.

I do believe that gnathostatic measurements and methods of diagnosis permit one to locate the occlusal plane accurately with relation to the rest of the head and to reveal conditions that otherwise, notwithstanding much experience, are often overlooked; and the relation of the occlusal plane to the surrounding structures is of much importance, and I believe the anteroposterior inclination of the occlusal plane often has a distinct influence in producing Class II malocclusions and is a resisting factor in their treatment.

The classification as used by Dr. Lischer might be very helpful if its use were agreed upon generally, but it seems very complicated to those who have not studied it carefully, and I am still partial to the Angle classification which gives a clear picture of the general condition and which with a few modifying phrases, will accurately describe any malocclusion. Yet I am open to conviction.

I believe one of the main reasons why gnathostatic methods have not been more readily adopted is that those who have developed them have in their presentations made them so complicated that the average busy man becomes rather antagonistic. The few fundamental truths are so enmeshed with the long and tedious paths of investigation through which the authors themselves had to travel, that the majority are discouraged before they are half through and hostile before they have finished their perusal.

For my own part, I believe that the relation of the canine to the orbital plane is a valuable corroborative piece of evidence. I also believe, as before stated, that the relation of the occlusal plane to the surrounding structures is an important thing to know. It is valuable to know whether it is very much higher on one side than it is on the other, which is not revealed by previous methods of diagnosis and is well revealed by those in question, but I do not feel it necessary to make a number of intricate graphs of models, which I already have before me.

I applaud all the hard work, the research and investigation which various authors have gone through to arrive at their conclusions. For practical purposes I feel that the presentation we have had today is the first one which will commend itself to the average busy practitioner, who himself may be immersed in some other problem and cannot give time to go deeply into another subject, the results of which can be presented quite briefly and the method used without great difficulty.

In my own hands, although I have not used these methods as extensively as many others, they have nevertheless proved a great help and satisfaction to me in my work.

Dr. Milo Hellman.—The outstanding feature in Dr. Lischer's paper is an attempt to demonstrate a more elaborate method for diagnosing malocclusal conditions. The types of malocclusion mainly dealt with are those known as Class II (Angle) or distoclusion (Lischer). He very carefully describes several cases of malocclusion in order to convey a clear idea of what is wrong in their general make-up. Then using the features described or analyzed as the diagnostic symptoms, he ventures to foretell or prognosticate the outcome of each of those cases. That this procedure is all-sufficient in the estimation of the essayist is quite evident from the concluding remarks. He states that, "If we are striving for greater clarity, for a finer differentiation in our methods of diagnosis, for more efficient methods of treatment, for a reduction in the number of failures, we ought to face the problems of diagnosis frankly and sympathetically, in a spirit that will not decline to interpret dental anomalies in a more comprehensive manner." Dr. Lischer may be quite right in his contentions, but he certainly does not convince one that it is so. A statement of a discovery to be of scientific value and to carry conviction must be guaranteed by proof. What proof does Dr. Lischer furnish to substantiate the correctness of his diagnosis and the reliability of his prognosis? Simply statements. By just saying that the prognosis of this or that case is either favorable or unfavorable, the "efficient methods of treatment" or "the reduction in number of failures" is not satisfactorily demonstrated. Dr. Lischer would certainly have added much to show the efficiency of his procedure had he supplemented his arguments with concrete evidence in the form of successes or failures in treatment of those cases, the prognosis of which he makes with such confidence. Until such evidence is forthcoming, the points made in this paper must be taken with a good deal of reservation.

In discussing the case report of Dr. Suggett, I am obliged to begin where he finished and to use the rest of the report as evidence for or against the justification of his conclusions. It is the last paragraph to which I wish to confine my remarks. I shall quote it sentence by sentence and make such comments as are necessary.

Sentence 1: "A gnathostatic diagnosis definitely shows us if the maxilla is correct sagittally and thus indicates whether or not it should be moved." Of course this statement is not quite clear, but I take it to mean that the kind of method used to diagnose this particular case will enable him to *move the maxilla* if he so desires. While I question the advisability and even the possibility of moving a maxillary bone in the living, I am, nevertheless, open to conviction. If Dr. Suggett can do it and if he can prove that he has done it, I am willing to believe it. But until then the burden of proof will rest on him.

Sentence 2: "We use the same methods of diagnosis to determine what we have done after the case is finished." Since the matter is so simple, it is quite difficult to understand why Dr. Suggett fails to furnish more reliable proof than he does. The case reported as evidence for his contention is in his own words, "*not yet finished*" (italics are mine). I know that Dr. Suggett has been in practice a good many years. He adopted his present

method of diagnosis when it was first imported to America, several years back. He surely has or should have at least one finished case of this sort. Why does he report an unfinished product of all his labors?

Sentence 3: "As we use the same plane for our measurements before and after, we know what movements have taken place." Granted, for the sake of argument, that "we know what movements have taken place," how do "we" know that these movements are the correct movements? If, as was stated above, the method of diagnosis "indicates whether it [the maxilla] should be moved," would it be rational—or good orthodontia—to move it and to reconcile ourselves with the fact that "we know what movements have taken place"?

Sentence 4: "To affirm that either maxilla or mandible has been moved without having gnathostatic models, before and after, is mere guesswork." Very well, but what proof does Dr. Suggett furnish to carry the conviction that he is not guessing? The poor models? And what of the "before" alone? Where is the "after"? The case "*is not yet completed.*"

The concluding remark Dr. Suggett makes has reference to a generalization which has nothing to do with the report. He states, "Scientists are trying to get away from guesswork." Very true. But then he asks, "Are we scientists?" Emphatically *NO*. I am, nevertheless, hopeful that "we" are at least *good orthodontists.*

Dr. Martin Dewey, New York City.—You have listened to some very interesting papers and discussions upon the diagnosis and treatment of apparent distoclusions. I will begin my consideration of these discussions and papers by starting at the last. Dr. Kelsey has called attention to the valuable information that can be gained by the gnathostatic model and photostatic photograph. He has also thrown out certain lines of caution against accepting all these rules and laws laid down by the advocates of this method as being final and correct.

I agree with Dr. Kelsey, and also with my friend Dr. McCoy, that you can gain a great amount of knowledge from gnathostatic models and photostatic photographs, providing you realize that some of the previous statements made by some of the men advocating this method in Simon's writings have been incorrect. Dr. Kelsey, as well as Dr. Hawley, mentions the fact that you must remember the orbital canine law was not infallible. Some of the other writers and some of the other papers presented were not so free and liberal; they seemed to imply, but did not state, that the orbital canine law was not infallible.

Even in Dr. Hawley's discussion, when he started out by reviewing the different methods of treatment of posterior occlusion, he laid considerable emphasis upon the fact that Dr. Angle stated in 1905 that the maxillary molar always assumed the normal position in the maxilla provided it had not been influenced by mutation.

Strange as it may seem to you, I make the statement here that Angle's statement never has been disproved. All of Simon's investigation does not show but that the maxillary molar does assume normal position in the maxilla unless influenced by mutation. That has not been disproved, I say again.

Simon, after building up his argument on that statement, brings forth the orbital canine law which he says is also a fiction, but he tries to base his statements according to the textbook on the orbital canine law. He has failed to prove the orbital canine law is any more infallible than Angle's statement regarding the first molars. Simon presents patients with gnathostatic models so far as vertical development is concerned, which, my friend Dr. Kelsey says, so far as the relation of the plane of occlusion to the eye plane is concerned, are very valuable, as valuable as anything we have at the present time, but the photostatic photograph I think has been very much overrated.

I say it is overrated, first, because as it is made the picture is very small compared to the life size. Then, after they have made the photograph they attempt to locate on that photograph the orbital point, the tragus and the point of the chin, which I say cannot possibly be located on the photograph, because, first, of the small size, and second you have difficulty locating those points on the living individual. Furthermore, Dr. Hawley made the statement that the investigations made by men who are attempting to dispute the infallibility of the orbital canine law as stated by Simon had been made on the skull, and no similar investigations had been made on the living individual. The only reason I can conceive for a man's

making that statement is that he is unfamiliar with the investigations that have been made in the last year by different men and which had begun many years previously.

There are methods which establish the plane of occlusion to the profile; there are methods which establish definite anatomic points to the profile, and those methods, at least some of them, are quite old. One was described, I think, about 1916 and was worked out as a result of investigations by Van Loon. A great amount of work has been done, first worked out by Dr. Eby and myself; that is, Dr. Eby did the work on me; I was the subject. We established the facial cast with the dental insert. I contend today that the facial cast with the dental insert is the most valuable and positively indisputable evidence of any method of judging growth and changes during treatment that has yet been considered as any one single method. The reason I say that is because you have a dental apparatus definitely and positively located in the face, and also active reproduction of enough anatomic points that you can go back and measure that any time you want to.

Dr. Eby's technic was further improved upon by Dr. Oliver, who published a paper on this subject several years ago. Dr. Margolis of Harvard carried on this treatment on several patients. The only objection is that it is disagreeable to the patient to take a facial cast, and it takes an operator about a week to complete it. Economically it is impossible.

Coming back to Dr. Hawley's paper, which is more or less an historical review of methods of treatment, he seems to have got his dates and facts rather mixed. He calls attention to the fact that Angle brought forth his theory, the first molar definite point of diagnosis, in 1905 and after that time began the treatment of posterior occlusion cases by moving the mandible forward and not changing the maxillary arch so far as anteroposterior relation is concerned. Angle's seventh edition came out in 1906, one year after the paper in Chicago. In that textbook he definitely and positively, in fact, featured a method whereby the maxillary arch was moved posteriorly and the mandibular arch was moved forward. He continued teaching that to his students until 1909 when friendly relations between him and me ceased; the greatest factor in breaking those friendly relations was that I contended that in those cases where the maxillary arch occupied a normal anteroposterior position, it should not be moved back, but the mandibular arch should be moved forward. Some of the older students in those classes may recall what I say as being true. So far as I know he has never changed that plan of treatment. Angle has always held to the plan of moving the maxillary arch back and the mandibular arch forward. He has never changed that plan.

Different types of appliances have always been so constructed and manipulated as to feature that plan.

So much for this history regarding treatment. Hawley would have you believe that Angle has changed his method of treatment since Simon brought out his orbital canine law, or since the "new and modern appliance" has been developed.

Dr. Hawley refers to some of the failures which have occurred with previous methods of treatment. He especially refers to those failures which have occurred where the mandible has been carried forward, and the difficulty of retaining it. With that I agree. I have never seen a case of posterior occlusion in my life in which I believe the mandible should be carried forward. The mandible should be developed, but not carried forward.

In regard to methods of diagnosis whereby we have considered the relation of the denture to the facial profile in the living individual, we will show you those in a few minutes.

I do not know that there is anything I need say in regard to Dr. Suggett's discussion, because Dr. Lischer has mentioned the points which I noted here as being quite confusing and hard to understand. I will pass to the principal paper of the day, which I think is that of Dr. Lischer, and begin my discussion by reading something which I have written here.

Dr. Lischer calls attention to the fact that in 1917 the American Society of Orthodontists adopted certain terms of nomenclature, and he immediately turns around and discards them and adopts something else which I think is much more faulty, much less valuable.

I have gone to considerable length about this, because these things are being considered by the Committee on Nomenclature of the American Dental Association. These terms, I might say, have already been condemned by that committee. I hope the committee appointed on nomenclature in this Society will consider them in a clear and fair way.

I have always had a great admiration for Dr. Lischer, and I think the biggest mistake he ever made in his life was when he kicked his own terms out of the door and adopted these others which are less scientific. (Dr. Martin Dewey showed his slides.)

Dr. B. E. Lischer, St. Louis, Mo.—Though I made quite a number of notes during the discussion yesterday, it is getting late, the hour of final adjournment is rapidly approaching, and so I shall not detain you very long. Besides, the wandering criticisms of gnathostatics presented in this discussion are based on misunderstanding and do not invalidate its philosophy or the usefulness of gnathostatic methods of diagnosis.

Variation (a factor of organic evolution) has been mentioned in such wise as though gnathostatists were ignorant of its widespread presence. Now, anyone who has read the literature knows that these methods have been offered because of a comprehensive knowledge of variation and not in unlettered ignorance.

Broadbent's investigation of the behavior of the orbital plane on crania has been mentioned, and a lantern slide of his frequency curve has been shown. Dr. Simon answered that in the *Dental Cosmos.** Many of the other irrelevant arguments presented have been fully answered by Simon in the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY.†

Then the discussion wandered into nomenclature and may I hasten to state that anyone who wants to reform dental nomenclature has my best wishes. Sometimes I, too, am worried whether a "crown" means a gold crown or a king's crown; whether a "bridge" means a dental bridge, a railroad bridge, or a game of bridge. But seriously, my friends, are we really keen to let the scientific world know that we are afraid to use the six simple words that Simon recommends in all modesty? The very name of our art—"orthodontia"—was criticized some years ago by eminent English philologists, and at the request of the British Society of Orthodontists, Sir James Murray offered the word "orthodontics." I immediately adopted this better term, but I was severely criticized for it.

It was also stated yesterday that one of the biggest mistakes I have ever made was "when I threw my own terminology out of the back door." Now, that is not true. The fact remains that I still use my diagnostic terms (neutroclusion, distoclusion, mesioclusion, etc.) as tentative, clinical terms. The six cases included in my part of this symposium were all bilateral distoclusions, marked as such on the memoranda which accompanied their impressions into the laboratory. But the differential diagnosis of each case is something entirely different. Thus we see that the term distoclusion, for example, is a generic term, like fever, or inflammation of the bowels, etc. If a scientific internist is confronted with a case of the latter, he will differentiate and determine whether he is dealing with enteritis, duodenitis, jejunitis, colitis, appendicitis, rectitis, etc.

It is apparent that some critics of gnathostatics do not only misunderstand it, but that they do not want to understand it. Gnathostatics is not based on a hypothesis which, when accurately stated, includes a coefficient of probable error. Simon has said very clearly that "the orbital law of the canines is not a natural law, but a fiction, and that its only justification is its usefulness."

It is, of course, true that a hypothesis must either be verified or else be discarded; but a fiction cannot be verified, it is not intended that it should be verified; it need only be justified.

Now some of you may smile and say: Of what use is a fiction; perhaps it is all "bunk" after all. May I remind you that all the noble aspirations of our lives are based on fictions. The government of the United States, for example, is based on a juristic fiction. Surely no one here today believes naïvely, or literally, that "all men are created free and equal, and endowed by their creator with certain inalienable rights." For countless ages men came together in political conferences and counseled with each other and finally found it useful to say that all men *are* equal.

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*February, p. 204, 1928.

†INTERNAT. J. ORTHO., ORAL SURG. & RADIOG. **14**: 592, 1928.

Some years ago, at a banquet of a national, public utilities organization, shortly after the late Governor Folk of Missouri investigated the graft in official life, the president and toastmaster closed his spirited remarks with the words: "The voice of the people is not the voice of God." Later in the evening a distinguished St. Louis lawyer responded to a toast and in the course of his remarks said: "The voice of the people may not be the voice of God, but it is the best voice we have."

Take the legal concept, justice. Is Colorado justice adequate in Missouri? Is Hawaiian justice applicable in Florida? Thus you see that justice is a fiction but, nevertheless, useful.

We are not advocating gnathostatics as something infallible or as the revelation of a secret long concealed. We are supporting it on the basis of its usefulness, and you cannot appreciate that until you try the methods. After that, your conversion will be rapid and certain.

In the clinics yesterday I saw evidences of a growing tolerance, a more kindly attitude to these newer ideas. Some one was demonstrating a profilograph, which is an old and obsolete attempt at two-dimensional orientation. It is a groping for cephalometric diagnostic principles.

I was very much interested in Dr. Hellman's paper and am looking forward to a careful reading of it when it is published. It is very important that we thoroughly investigate the variability of the human denture in all its relations. That is a task we ought not to neglect. I appreciate his efforts in studying the correlations of which he spoke, and it would be very interesting, and perhaps equally instructive, to investigate similar facts on the living. All in all, it is further evidence that gnathostatics and cephalometric diagnostics are opening new vistas; such work was not attempted before the introduction of these newer methods of diagnosis.

Finally, I want to thank Drs. McCoy and Kelsey for their generous remarks and the conversant and pertinent manner in which they discussed our symposium.

Dr. A. H. Suggett.—I am glad that our symposium has called forth such a lively discussion. It indicates that the subject is of sufficient importance to investigate or that it is so dangerous that it must be killed or suppressed before it corrupts the whole orthodontic world. Permit me to say in reference to Dr. Kelsey's objections that if it is too complicated for a busy man, perhaps if a busy man should take a little more time to diagnose his cases, he might not have to be so busy working on them. The remarks of the two wise men from the East remind me of learned lawyers who have a poor case, and they always resort to technicalities.

I was asked to describe my treatment of a case of apparent distoclusion in which the diagnosis showed that the dentofacial relation of the maxilla was correct sagitally. I showed my method and technic of moving the mandible forward to the correct dentofacial relation without disturbing the maxilla. I proved this by measuring from the same planes before and after treatment. The case *is* finished in that the mandibular teeth are occluding in the proper intervals of the maxillary teeth, and the retainer has been placed. Many orthodontists call a case finished when the retainer is inserted and they collect their last payment. But you and I know that a case has not been finished until the retainer is removed, and then some. I admit that I should have at least one finished case, but I was not asked to write a paper showing finished cases.

If to measure from the same cranial plane before and after treatment does not prove what has and what has not been moved, how would you prove it? By a hunch? Answering the learned gentleman categorically: (1) I will say that I have moved maxillary teeth and the bone they are imbedded in, in six different directions. (2) I have at least one finished case. (3) Yes, it would not be a bad idea to move the maxilla just to find out if you could. (4) How can the fact be proved to you if you will not accept standards of measurements?

It is very important for us to know precisely what we have done after correcting a case of malocclusion. I have heard wise men, men who made wise cracks, affirm that they had moved the mandibular teeth forward or back, or they had moved the maxillary teeth forward or back, they had depressed mandibular or maxillary teeth, and they proved it by a little pair of models of the gay nineties and a hunch.

My proof that I am not guessing is the gnathostatic measurements and photostatic pictures. I agree with the wise gentlemen that we are not scientific and we never will be if we rely on a hunch, and I will also agree with him when he says "I hope we are at least good orthodontists" if he will change two words and make it "I wish we were at least scientific orthodontists."

If Dr. Dewey will work out some of his methods of arriving at dentofacial practices so you can do them in less than a week, which he says his takes, and present a plan which can be worked out in less than two or three hours, or less than Simon's method takes, I will be for them, I will not oppose, I will accept them gladly. I will advocate Simon's only until something else is presented that is better.

What we really need, however, is some method of making our leading orthodontists lead without so much shoving by us, their mere followers.

THE ORBITAL PLANE

Its Relation to Dentitions of Different Races, to Dentitions in the Course of Development, and to Dentitions in Malocclusion*

By Milo Hellman, D.D.S., New York, N. Y.

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REFERENCE is often made to the wonderful strides made in the progress of orthodontia. Orthodontia, it is usually claimed, has advanced more in recent years than in all its recorded history. The human element involved in such statements is quite obvious. It amounts to little more than a sort of patting oneself on the back. Such statements, as a rule, are made on the basis of certain specific instances only and could not be applied with equal force in a general way. If the various phases comprised in the specialty of orthodontia are subjected to a critical examination, it will soon be discovered that not all of them are progressing at the same pace and that not all of them have reached the same state of advancement. For example, the technic of making and using orthodontic appliances appears to have advanced away beyond the fondest dreams of any one. The knowledge, however, required to determine with some degree of accuracy when appliances are needed and should be used and when not, is lagging considerably behind. But, what is of particular interest in this connection is that the practice of extracting teeth for the purpose of correcting (?) malocclusal conditions is as crude a procedure now as it was when first originated.

Extraction as a means to "straighten crooked teeth" was resorted to as far back in the history of dentistry as there is any record of—and the records of dentistry extend a good many hundreds of years back. It was only at the beginning of the present century that this practice came into disrepute. This came about through the influence of Edward H. Angle. Developing his method of orthodontic treatment on the basis of occlusal relationships of the teeth, Angle came to the conclusion that it is essential to retain "the full complement of teeth and that each tooth must be made to occupy its normal position" in the attainment of normal occlusion. Angle thus in 1903 showed the courage of his convictions when he took a firm stand against extraction and condemned it. The recognition by the profession of the validity of his views marked the first step in the direction of establishing orthodontia on a fundamental basis. All practicing orthodontists who were moved by the progressive trend of the time saw the practical benefit of Angle's views and adopted them. The others remained indifferent.

No one can gainsay the fact that the sway hitherto held by Angle and his followers did much to elevate orthodontia. One of the features that

*Read at the Twenty-eighth Annual Meeting of the American Society of Orthodontists, at Estes Park, Colorado, July 15-20, 1929.

Read at a meeting of the Southern Society of Orthodontists, January 31, 1929.

helped attain this end was to discourage extraction in orthodontia and to brand it as pernicious practice. Thus, for many years extracting teeth for orthodontic purposes was kept in abeyance. At no time was it really suppressed. Those so inclined kept it up, but they either denied it or were reluctant to admit it. During the last few years, this practice broke out again with renewed vigor. The sponsor for this outbreak is Dr. Paul W. Simon, of Berlin, who provided a so-called scientific reason which seemed to furnish a convenient refuge for those who have still been resorting to extraction and for those who consider extraction a satisfactory short cut. It is not my intention to advance any arguments against those who have found comfort in extracting teeth for the purpose of facilitating orthodontic treatment. I know quite well that after all is said and done those who made it a practice will continue doing it. My purpose is just to show that there is no scientific reason which may be used in defense of such procedure.

Dr. Simon's justification for extracting teeth hangs on a discovery which he claims to have made. This discovery has reference to a relationship which he found existing between certain anatomic landmarks. The landmarks in question are: the point on the lower border of the orbit known by anthropologists as *orbitale* and the tip of the maxillary canine tooth. The main conclusions reached by him rest on the following claim: If normal adult skulls are oriented on the Frankfort plane and a vertical line is drawn from *orbitale* downward at right angles to the Frankfort plane, it will pass the tip of the canine cusp. The prevalence of this relationship as claimed by Simon is so frequent that he adopted is as a law, "the orbital law of the canine." The law is subsequently further developed on the assumption that if the two orbital points are united by a line, and that line extended into a vertical plane downward, the plane will pass the canine points on both sides. This assumption is advanced in the form of a theory, "the theory of the orbital plane." The details of his investigations leading to these conclusions are well known to all interested in this matter and need not at this time be dealt with further. For a fuller account on this subject Simon's recently translated work *Fundamental Principles of a Systematic Diagnosis of Dental Anomalies* is recommended.

Simon's conclusions, however, have not been unanimously accepted. In fact no one with practical experience in anthropometric procedure shows any disposition to take them seriously. Thus Connolly, Broadbent, Wolfson, and Oppenheim who have done extensive researches of a similar kind not only fail to verify, but definitely refute the basis of Simon's conclusions. Stanton, too, although approaching the problem from a different angle, disposes quite successfully of Simon's most important deductions. On the other hand, all these investigators practically agree that a vertical drawn from the Frankfort horizontal plane at *orbitale* is variable and usually falls behind the canine. The extent of this variability is approximately from 2 to 18 mm. distal to the canine cusp point.

Were it a question of academic interest only, this matter might be dismissed at once and nothing further need be said about it. But the matter does not end here. There are some complications. All orthodontists interested in this question are quite well aware of the fact that Simon's "canine law" is to be

invoked for the purpose of advancing a new method for diagnosing certain malocclusal conditions. These conditions, as well as the characteristics associated with them, were well understood before Simon appeared on the scene. They were, however, designated as Class II, Division 1, according to Angle's classification. Simon knew that. But what he did not like about it was that Angle's classification was originally based on the assumed constancy in position of the maxillary first permanent molar. So, in order to put one over on Angle, he went to the extent of all the work entailed in his investigations, supplemented that with a philosophic treatise on "The Norm as a Fiction," just to prove what was already well known, that the maxillary first permanent molar is not constant in position. The curious thing about it all is that no sooner does he prove his thesis, but he at once lays claim to the discovery that *the canine is constant in position* and that its position is determined by the position of the orbital point.

This turn of events does look rather incongruous. But this does not bother Simon a bit. He has established his point and goes right on using it as a basis for diagnosis which naturally must be followed by a different method of treatment. Since his diagnosis is not based on the occlusion of the teeth, the treatment recommended has for its object the esthetic improvement of the face alone. The diagnosis thus proposed by Simon is based on the "canine law" for the following reasons: If in a given case, for example, the orbital point is found to be posterior to the canine point, Simon contends that the upper dental arch is too far forward. The treatment, therefore suggested, is to extract certain teeth distal to the canine and to push the incisors and canines back so as to bring the latter under *orbitale*. In this manner the canine is brought back to what Simon thinks is its "normal position." That the teeth distal to the canine are left in the abnormal position where they were before seems to matter little because their occlusion is not considered at all. By this method Simon and his followers claim to be able to obtain more permanent and lasting results. Why their results were not permanent and lasting before adopting this procedure is not quite clear. Was it due to wrong diagnosis or improper treatment? They also lose sight of the fact that this sort of procedure is at best but the treatment of the symptom alone and not of the condition which gives rise to it.

In my estimation all this is but a smoke screen used to obscure the real issue; i.e., to find an excuse to justify the traditional tendency toward extraction. It is on this account that I desire to present the results of some investigations which I hope will throw a little more light on the situation in general and perhaps help to clear up the hopeless confusion created by Simon. Since the evidence of my investigations was derived from studies of skeletal material and from results of treated cases, I am in hope that it will prove to be of scientific interest as well as of practical value. For the purpose of clearness, I shall divide my topic under the following captions:

1. The relation of the orbital plane to the dentitions of different racial groups.

2. The relation of the orbital plane to the dentitions of different developmental groups.

3. The relation of the orbital plane to the dentitions in malocclusion.

4. The lesson learned from anthropometric and other records of treated cases.

1. THE RELATION OF THE ORBITAL PLANE TO THE DENTITIONS OF DIFFERENT RACIAL GROUPS

The first investigation was conducted on a series of adult skulls with the aim in view of checking up the situation from a general aspect. The method of procedure was somewhat different from that followed by Simon and the investigators named above. The skulls studied were oriented in the usual manner on the Frankfort plane by means of a Ranke craniostat; but the craniostat was placed on a glass slab, adjusted to the horizontal with the aid of an alcohol level. A sliding caliper to which the Ansteck goniometer was fastened was held vertically so that the goniometer hand pointed at 90°. Placing then the upper point of the calipers on *orbitale* note was made which tooth or part of it came into contact with the lower point. The results were charted on a diagram and arranged as seen on the chart, Fig. 1, which gives

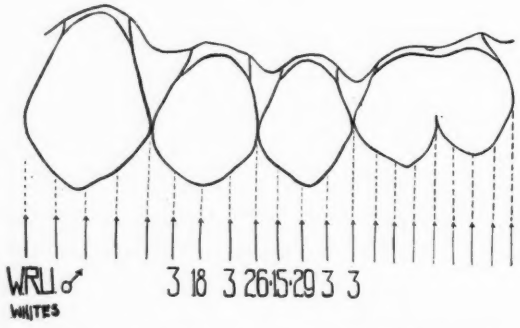

Fig. 1.—Chart of orbital plane, showing the percentage distribution of the relationship of *orbitale* to the teeth in European whites (W. R. U.).

the frequency of their distribution in percentages. This chart, consequently, represents the extent of relationship of orbitale above to the teeth below in a group of 34 skulls picked from the collection at the Hamann Museum at the Western Reserve University. They are skulls of white adult males of European stock. Most of them possess the full complement of teeth, and all of their dentitions are in normal occlusion.

As indicated in Fig. 1, none of the skulls shows any relationship between *orbitale* and canine point. On the contrary, *orbitale* falls behind the canine in all instances and varies widely. The most anterior point represented by *orbitale* falls on the mesial slope of the buccal cusp of p^1 (3 per cent). The frequency, however, will be noticed to rise as one proceeds backward. Thus in 18 per cent of the cases *orbitale* falls on the buccal cusp point of p^1, in 26 per cent it falls in the interproximal space between p^1 and p^2 and in 29 per cent on the buccal cusp point of p^2. After this point there is a sudden drop in its frequency. The spread of this character thus presented clearly shows the range of the variability and the spots of its more frequent occurrence, which are just points of higher concentration. The relationship of the orbital

plane to the teeth thus becomes a feature of considerable diversity and not of constant or uniform association. By the use of perhaps a more exacting technic, by an increase in the number of specimens and by a different method of assortment a more orderly succession of the points of concentration appears. As seen in the chart, Fig. 2, taken from Broadbent's paper "Investigation on the Orbital Plane," there is an orderly increase and decrease in frequency of the point of relationship yielding a curve very close to the form of the normal

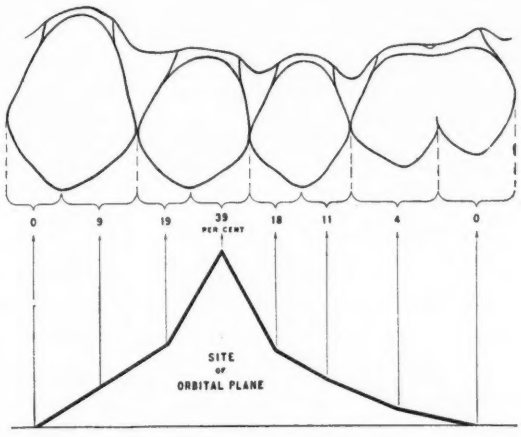

Fig. 2.—Chart of orbital plane in its relationship to teeth. (After Broadbent.)

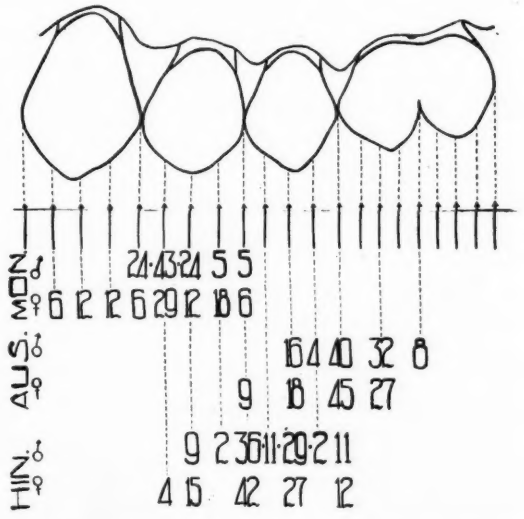

Fig. 3.—Chart of orbital plane, showing the difference in the percentage distribution of the relationship of *orbitale* and the teeth in Mongols, Australian, aboriginals and Hindus. HIN Hindu; AUS Australian; MON Mongol; ♂ male; ♀ female.

curve of probability. Broadbent used the same material that I did, but he used more than twice as much of it and divided the "sites" of concentration somewhat differently. The actual result, however, points to the same general facts. Namely, the orbital plane, like other anatomic features, is variable, and its relationship to the teeth is spread from the canine to m^1. In the greatest number of instances, i.e., in 65 per cent of the cases (Broadbent 76 per cent) it falls from the mesial slope of the buccal cusp of p^1 to that of p^2.

By the application of this procedure to skulls of different races, the lack of uniformity in this relationship can be still further demonstrated. This is because in addition to its normal individual variability there also appear racial differences. Thus, in Fig. 3 the orbito-dental relationships of three racial groups are charted. These are Mongols, Australian aboriginals, and Hindus. The contrasting difference between the Mongols and the Australians is seen at a glance. This contrast is more emphasized when the males alone (♂) are compared. Thus, in the Mongols the orbitodental relationships are not only situated considerably more anteriorly, but they are also more concentrated, clustering around the first premolar. In the Australians, on the other hand, this relationship is considerably more posterior and also more widely spread out. The Hindu males again present this feature intermediate in position, although it has a wider spread than either in the Mongols or in the Australians. It begins at the highest concentration point of the Mongols and ends at the highest concentration points of the Australians. If a further comparison between males (♂) and females (♀) is made, it will be noticed that the distribution of this character in the females is more forward than it is in the males. This anterior position in the female, as is clearly shown in Fig. 3, is more emphasized in the Mongols, less in the Australians and least in the Hindus.

Evidence from many other sources could be added, but there would be little gained since it all proves the same point, namely, that a uniform relationship between the orbital point and the canine point does not exist. On the contrary, one is forced to the conclusion that *the orbitodental relationship is a highly variable character and that it differs widely among different races, between the sexes of the same race and among the individuals of the same sex.*

2. THE RELATIONSHIP OF THE ORBITAL PLANE TO THE DENTITIONS OF DIFFERENT DEVELOPMENTAL GROUPS

It would seem that when a wrong attitude is assumed in one respect that it usually is accompanied by like attitudes in other respects. In discussing the application of his methods to individual development, Simon states that "since the lower facial region develops more synchronously with the denture than do the orbitalia with the upper face, it would seem that the relation of the denture to the orbital plane varies considerably during the course of individual development. My observations," says he, "lead me to believe that this is seldom the case. Of course," admits Simon, "I have not investigated this matter definitely, merely incidentally." And yet he ventures to say that "under normal conditions the orbital plane intersects the denture in the region of the canine; and it does this at any age—from five to forty years—in the temporary as well as the permanent teeth." A clearer statement of his belief could certainly not be made. But the trouble is that his belief is not quite trustworthy. The evidence derived from an investigation on this very problem will furnish the proof. In this investigation a collection of skulls of ancient American Indians was used. In this collection, consisting of 104 skulls, there is a complete range of ages from early infancy to senility. Of course, the exact ages of the individual skulls are not known. It is, never-

theless, possible to assort them in separate groups according to stages of development. This was done mainly on the basis of the stage of development reached by the dentition. Seven such stages can thus be quite definitely recognized. They are:

Stage I.—The period of early infancy, which is designated by that state of development before the deciduous dentition is completed.

Stage II.—The period of late infancy, which is designated by that state of development when the deciduous dentition is completed.

Stage III.—The period of childhood, which is designated by that state of development when the permanent first molars are erupting or have erupted, in addition to which some or all of the deciduous incisors have been lost and are being replaced by the permanent successors.

Stage IV.—The period of pubescence, which is designated by that state of development when the second permanent molars are erupting or have

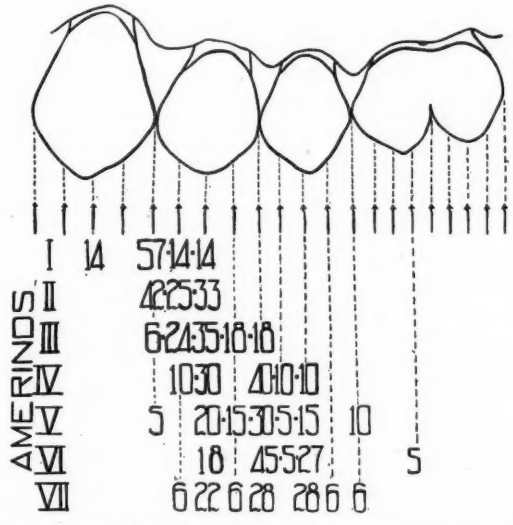

Fig. 4.—Chart of orbital plane, showing the differences in relationship of *orbitale* and the teeth at various stages of development.

erupted, in addition to which some or all of the deciduous canines and molars have been lost and are being replaced by their permanent successors.

Stage V.—The period of adulthood, which is designated by that state of development when the third molars are erupting or have erupted.

Stage VI.—The period of old age, which is designated by that state of development when the occlusal surface of the molars is worn off to the extent of obliterating the pattern of grooves.

Stage VII.—The period of senility, which is designated by that state of development when at least half the crowns of the teeth are worn off, accompanying or following which, some, most, or all of the teeth are lost.

When the relationship of *orbitale* to the canine point of these developmental groups is plotted, as has been done in Fig. 4, the tendency of the changes occurring during development may be seen at a glance. Thus it is quite clear that while this character is variable at all stages, it appears more

often at certain points in each stage. The points of highest frequency, however, differ in position at different periods of development. It may thus be seen that in early infancy (Stage I) the orbital plane falls on the interproximal point between the canine and deciduous molar in 57 per cent of the cases; in the rest it falls anterior and posterior to it. In late infancy (Stage II) the frequency at this point is decreased to 42 per cent, but the two points immediately distal to it increase to 25 per cent and 33 per cent respectively. In childhood (Stage III) the point of greatest frequency is further back, appearing on the buccal cusp point of p^1 or of deciduous m^1 in 40 per cent of the cases. The points of highest frequency proceed still further back in youth (Stage IV) where it remains during the adult (Stage V) and old age (Stage VI) periods. In senility (Stage VII) the frequencies become more dispersed. Thus, during development it will be noted that the orbitodental relationship is variable in each age group and that this variability assumes a different aspect in the different age groups. The general tendency, however, is for the orbital point to come into a more posterior relation with the teeth, as the face keeps on developing from early infancy to adulthood. After this period the intergroup relationship remains approximately the same, but the variability within the group spreads out over a wider range.

This chart then, holds a very instructive lesson for the orthodontist. It should impress every orthodontist with the fact that the problem of this particular feature as dealt with by the proponents of Simon's laws and theories was presented in the form of a finished and stable product as it appears in the adult. The evidence proves that it is neither stable nor finished. It keeps on changing. The patients of the orthodontist are, or should be, in those periods of life preceding the adult stage. The face and dentition at those periods are still undergoing development. There is no scientific criterion by which the exact outcome of individual development can be accurately predicted. What grounds, then, are there to justify the mutilation by extraction of teeth from a dentition before it is completed, especially when supported by no other proof than the relationship of the orbital point to that of the canine?

3. THE RELATIONS OF THE ORBITAL PLANE TO DENTITIONS IN CLASS II, DIVISION 1 MALOCCLUSION

By this time it ought to be quite clear to every one that the evidence so far furnished fails to support Simon's contentions. On the other hand, it does more than agree with the conclusions reached by Wolfson, Broadbent, Connoly, Stanton, and Oppenheim. The foundation, therefore, upon which Simon built his diagnostic structure is, to say the least, insecure.

There is, however, one more point to be considered. Let us assume that an error was made in the establishment of the canine law. We shall, therefore, make an honest attempt to save it by the adoption of an amendment. The amendment would consist in the adoption of the principle, but not the detail. Thus, admitting that the canine law is wrong, could it not be maintained that although the orbitodental relationship is variable, it may, nevertheless, point to the fact that in dentitions with Class II, Division 1 cases of malocclusion the orbitodental relationship is further back than in skulls with dentitions in

normal occlusion? The affirmative answer to this question would at least save the principle involved. Let us put it to test. Skull No. 1075 in the skull collection at the Western Reserve University has a dentition in Class II, Division 1 subdivision. The site of the orbital plane in this skull is in the region of the buccal cusp point of the first premolar. Since this relationship is also found in 18 per cent of the normal skulls and since in 79 per cent of the skulls with normal occlusion the orbital plane is much further back than this, would it not seem rather far fetched to maintain that a definite diagnosis of Class II, Division 1 can be made on such a basis?

A second test will help explain this situation still better. A group of 22 Hindu male skulls was examined in the same manner as above. Each of these skulls, too, had the full complement of teeth in normal occlusion. The results are recorded in the chart, Fig. 5. It will be noted that the orbital plane is spread over a similar, but more restricted area, beginning at the mesial incline of p^1 and ending at the buccal cusp point of p^2. The greatest concentra-

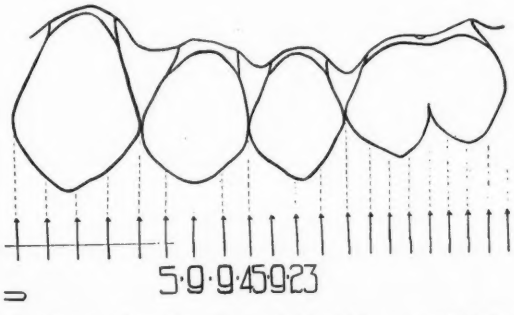

Fig. 5.—Chart of orbital plane, showing the relationship of *orbitale* to the teeth in Hindu male skulls with normal occlusion.

tion occurs at the interproximal point between p^1 and p^2, appearing there in 45 per cent of the cases, the next highest point is on the buccal cusp point of p^2 (23 per cent).

In this collection there are four skulls, the dentitions of which have Class II, Division 1 malocclusion. If, as is assumed, this type of malocclusion presents a condition in which the upper dental and alveolar arches are more anterior than under normal conditions, then skulls with such abnormalities should show it. This, however, does not obtain. Skulls Nos. 99/7775, 99/7794, 99/7891, American Museum, have Class II, Division 1 malocclusion, but *orbitale* falls in the interproximal space between p^1 and p^2. But 45 per cent of the skulls with normal occlusion also show the same relationship of *orbitale* and the teeth. Can such a feature be considered as a distinguishing factor (diagnostic symptom) by which such type of malocclusion is to be recognized? On the other hand, skull No. 99/7793, American Museum, has a Class II, Division 1 subdivision, with the *orbitale* relationship in the region of the interproximal space between p^2 and $m.^1$ While in this instance *orbitale* is in the most posterior position, the malocclusion is only a subdivision of Class II, Division 1. Another male skull No. 99/7894 showing the same relationship is one with Class I malocclusion, classified mainly on account of an open-bite.

From the weight of this evidence it becomes quite obvious that Simon's proposition cannot be held as having any bearing on a uniform orbitocanine relationship either in skulls with dentitions in normal occlusion or in skulls with dentitions in malocclusion. Moreover, since any sort of uniform relationship is wanting, its diagnostic value must be considered as questionable and the treatment going with it misleading.

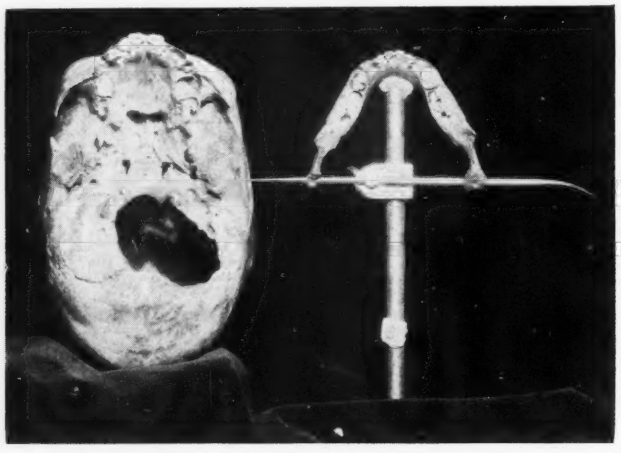

Fig. 6.—Skull of American Indian infant, Stage I, showing growth centers in the tuberosity of the maxilla and retromolar triangle in mandible, the relations of key ridge to the dentition being between the first and second deciduous molars.

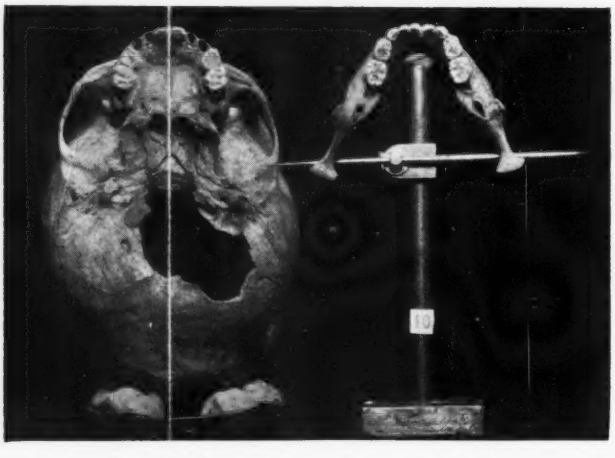

Fig. 7.—Skull of American Indian infant, Stage II, showing second deciduous molars fully erupted and foramen-like openings of maxillary permanent first molar in tuberosity and mandibular first and second molars in retromolar triangle. The key ridge is between buccal roots of the maxillary second deciduous molar.

4. EVIDENCE DERIVED FROM THE RECORDS OF TREATED CLASS II, DIVISION 1 CASES OF MALOCCLUSION

Before citing the evidence derived from treated cases, it will be of advantage to recall certain facts which are fundamentally concerned with the principle involved in the orbitodental relationship. Of the three planes into which the face is projected during its development, the one concerned in the orbitodental relationship is directed anteroposteriorly. It should be remembered

that development in this direction takes place by increments from behind; i.e., when the face increases its dimension anteroposteriorly, it really grows backward. This fact is well illustrated by the position of the growth centers of the jawbones. These centers are situated in the tuberosity of the maxilla and in the retromolar triangle of the mandible. Fig. 6 makes this point clear. Fig. 6 presents the occlusal view of the dental arches of an infant (Stage I) with the deciduous dentition not quite completed. While the first deciduous molars (broken in maxilla) are completely erupted, the second deciduous mo-

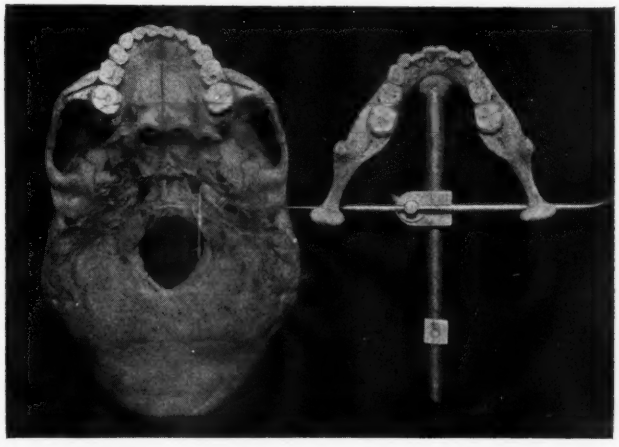

Fig. 8.—Skull of American Indian child, Stage III, showing M^1 erupted and key ridge between maxillary second deciduous molar and maxillary first permanent molar.

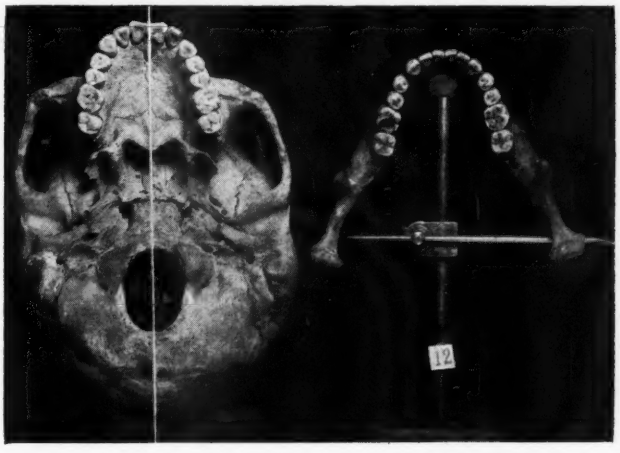

Fig. 9.—Skull of American Indian youth, Stage IV, showing second molar erupted and key ridge between buccal roots of maxillary first permanent molar.

lars are not as yet fully exposed to view. In this specimen the crypt on the maxillary left is broken, and the crown of the tooth was lost. The first permanent molars at this stage are situated in the tuberosity of the maxilla and in the retromolar triangle in the mandible. All of them are exposed only by a foramen-like opening of the crypt. The relation of the crest of the "key ridge" as is indicated by the line mark on the illustration, is between the two deciduous molar teeth. In later infancy (Stage II) the second deciduous molars are fully erupted (Fig. 7). Behind this tooth in the maxilla is seen a

large opening in the tuberosity, indicating the position of the first permanent molar. Another opening from the crypt containing the second molars is seen pointing toward the temporal fossa. In the mandible, too, are seen the large openings of the first permanent molar behind which the smaller opening for the permanent second molar is visible. If compared with Fig. 6 there is a notable increase in the region behind the deciduous first molars. This increase in growth of both jawbones behind the deciduous dentition is related to a forward shifting of the alveolar processes anterior to the growth center. Thus the crest of the key ridge which in the previous stage was between the two deciduous molars is now between the buccal roots of the second deciduous molar (Fig. 7).

Further evidences of the locus and the direction of growth are seen in Fig. 8. At this stage (Stage III) the permanent first molars have erupted, and the second permanent molar crown is taking its position in the tuberosity

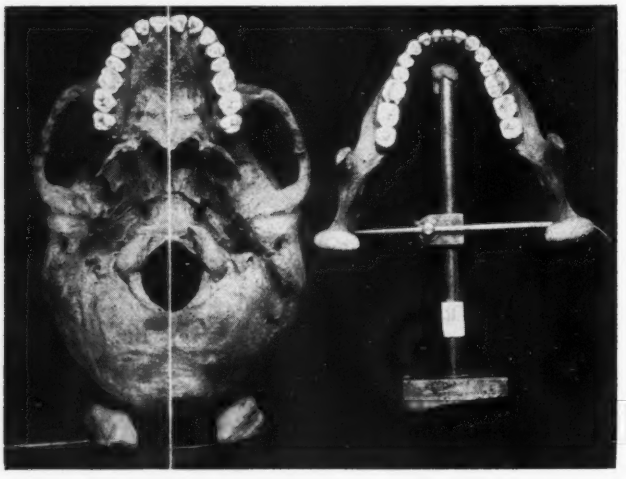

Fig. 10.—Skull of American Indian adult, Stage V, showing complete dentition; key ridge is between first and second permanent molars.

of the maxilla in connection with which the retromolar area has increased in the mandible to accommodate the mandibular second molar. The crest of the key ridge again has shifted, so to speak, back and is now between the second deciduous and the first permanent molars. In the following stage (Stage IV) the permanent dentition, less the third molars, is completed (Fig. 9). The third molars now occupy the position which the second molars did in the preceding stage. The key ridge again has shifted back and is now (Fig. 9) between the buccal roots of the first permanent molar. And finally, in the adult (Stage V) the third molars occupy the position previously held by the second molars (Fig. 10). The key ridge in this illustration is between m^1 and m^2. It should, however, be noted that Figs. 6 to 10 inclusive, though illustrating individual cases, are to be understood as typical manifestations of such relationships. The occurrence is not uniform. It varies and with it the several relationships. In Table I is given a detailed account of the variability in the key ridge and buccal roots relationship in 160 cases. It will be seen that as the jawbones keep on developing from stage to stage the key ridge

assumes a more posterior position to the teeth until adulthood (Stage V) is reached. After this stage no significant change takes place.

As these phenomena of growth appear, the entire facial mask undergoes a change in position. The face really moves and swings, as it were, forward.

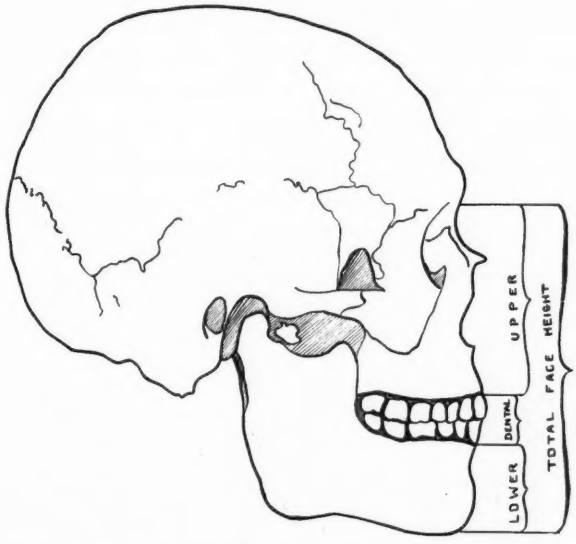

Fig. 11.—Diagram of skull showing method of measuring height of face.

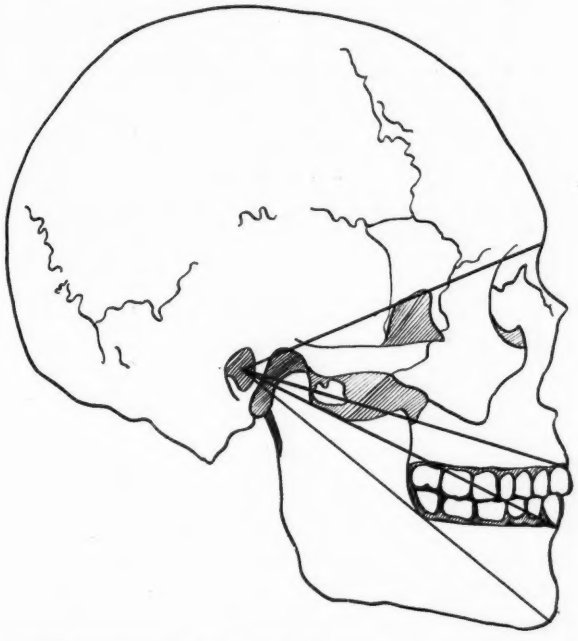

Fig. 12.—Diagram of skull showing the method of taking measurements representing positions of the face.

This forward swing occurs at the highest rate in the lowermost or chin region, at intermediate rates in the middle or dentition region, and at the lowest rate in the uppermost or nasion region. Thus, during the course of development the face and teeth undergo a continual change in their relative position not only to the brain case, but also to each other. These changes are

ascertainable by measurements of certain dimensions. In skulls these dimensions are obtained by measurements in the median line (or sagittal plane) by means of a pointer adjusted to the center on the craniostat. In the living, Todd's head spanner is used. The rods at the ends of the bow are inserted in the ear holes, and the bow is brought toward nasion, prosthion upper and lower, and menton, toward which the steel rod in the middle of the bow is pointed. The dimensions are indicated on the rod which is graduated to the millimeter scale. Figs. 11 and 12 show the directions of these measurements. The changes revealed by these measurements may be seen in Table II which gives the relative position of the two dental arches and the chin as compared to the ear-nasion dimension. Thus the upper prosthion is at first (Stage I)

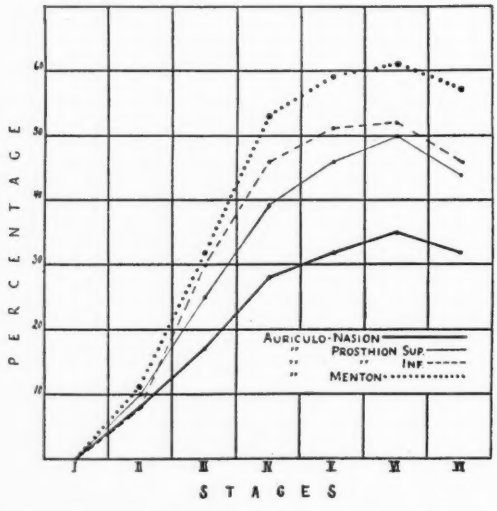

Fig. 13.—Chart of dimensions depicting position of face, showing the differences in percentage increments of the upper, middle, and lower portions of the face.

4.2 per cent less than the auriculonasion dimension. But as the face mask moves forward, it diminishes this shortage in Stage II to 2.8 per cent, thereafter increasing its dimension until it surpasses that of the ear-nasion by 8.3

TABLE I

SHOWING PERCENTAGE DISTRIBUTION OF KEY RIDGE IN RELATION TO BUCCAL ROOTS OF MAXILLARY DECIDUOUS AND PERMANENT MOLARS

	DM^1				DM^2				M^1				M^2
STAGES	MBR	IBR'S	DBR	IDS	MBR	IBR'S	DBR	IDS	MBR	IBR'S	DBR	IDS	MBR
I				91	9								
II					8	54	27	11					
III							12	71	17				
IV									37	50	13		
V									16	27	35	18	4
VI									3	10	45	38	3
VII								6		18	51	18	6

DM: Deciduous molar.
M: Permanent molar.
MBR: Mesiobuccal root.
DBR: Distobuccal root.
IBR'S: Interbuccal roots.
IDS: Interdental septum.

TABLE II

SHOWING THE CHANGE IN POSITION OF PROSTHION SUPERIOR, PROSTHION INFERIOR, AND MENTON, AS COMPARED WITH AURICULONASION DIMENSION

STAGES	PROSTHION SUPERIOR	PROSTHION INFERIOR	MENTON
I	−4.2	−3.3	2.1
II	−2.8	−3.5	6.6
III	2.5	8.2	16.2
IV	5.1	12.9	26.0
V	7.9	13.8	28.6
VI	8.3	11.6	26.4
VII	5.0	7.5	24.9

per cent in old age, after which there is a decline. The same thing happens in the dimensions of lower prosthion. But in this instance the process is more accentuated. The dimension from the ear-hole to the chin, on the other hand, is always greater than that of the ear-nasion distance, and shows the greatest

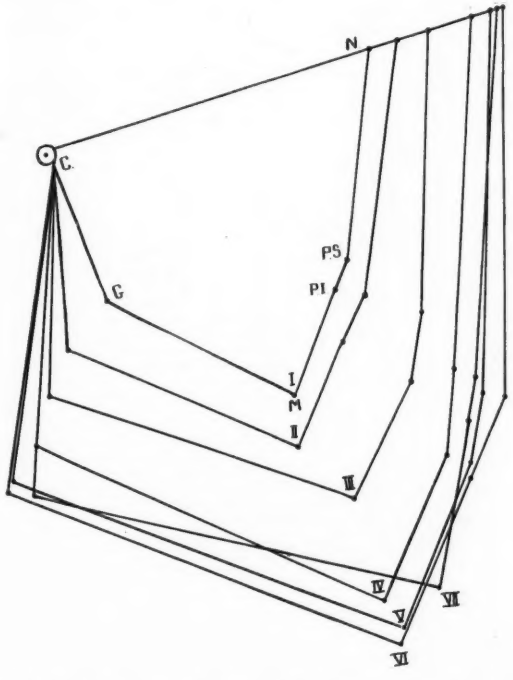

Fig. 14.—Diagram of profile projections of faces in Stages I to VII inclusive, showing the increase in size and change in position in the course of development.

increase and the least decrease. Fig. 13 illustrates the fact of the forward swing of the face in another way. In this figure the percentage increases and decreases are charted as they occur during growth in each separate dimension. Thus the ear-nasion dimension increases at the lowest rate, the ear-prosthion superior at a higher rate, the ear-prosthion inferior at a still higher rate and the ear-menton at the highest rate. By considering these different rates of increase it becomes quite clear that as the face swings forward all the dimensions keep on increasing. But the upper prosthion increases more than nasion, lower prosthion more than upper prosthion and menton more than lower prosthion.

Another diagram will illustrate these changes still more clearly. Fig. 14 represents a diagrammatic profile projection of the face at the various stages of development. This figure was worked out from the means of the measurements of face height, ramus height, anteroposterior dimension of the body of the mandible and the dimensions of position. It therefore combines increases in size with changes in position. The manner in which the measurements were obtained is indicated in Figs. 11 and 12.

This figure quite clearly illustrates that as the face goes on developing, different points measured increase more in size and change more in position. But as this is taking place, certain points increase and change more than others. This creates differences in the dimensions. These differences are due to two factors, the factor of time and the factor of space. An example of the

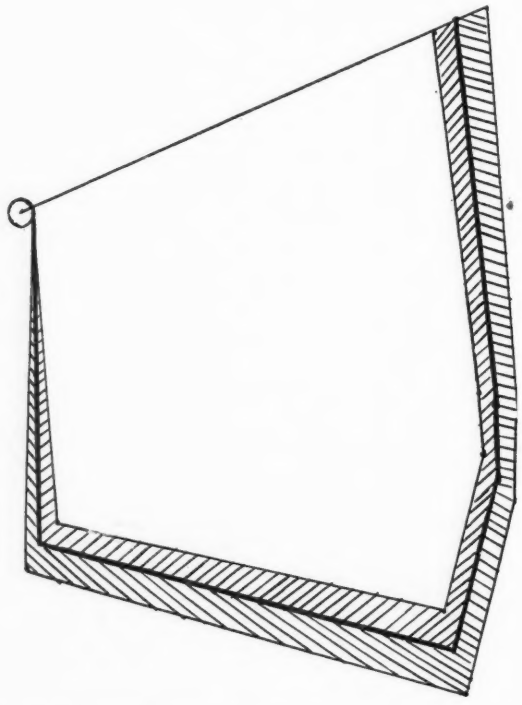

Fig. 15.—Diagram of the profile of the face showing average and standard deviation of adult group of American Indians. Heavy middle line is the mean, and the shaded area is the standard deviation.

factor of time is manifest during childhood (Stage III) when the face increases its dimension both in size and position more than at any other period of life or stage of development. An example of the factor of space is seen in that certain regions increase more than others. Thus while the face moves forward more in childhood than before or after, the body of the mandible increases in size more than any other portion of the face.

The fundamental fact emphasized in Fig. 14 is that as the face grows it undergoes a change in position, but different parts of the face at the same time assume different relative positions to it. When the process of development proceeds under favorable conditions, the final result is a normal product because the harmonious relation of size and position of one growing part to

another is maintained. Under adverse conditions the growth ratios of interrelated parts are not maintained, and disturbances occur which modify the features in both size and position. Thus if one part is retarded or accelerated in its growth, it will bring about not only disproportion but also malposition. Disproportion and malposition thus become causally related to each other and to the process of growth. Under such conditions the face, as well as the dentition, assumes an entirely different aspect. To make this point clear let us take an example of normal growth as presented in Fig. 15. This represents the profile of the adult faces of the developmental series of skulls from Fig. 14. The heavy middle line represents the mean of the measurements. The shaded areas on either side of the heavy line represent the range of variability as it

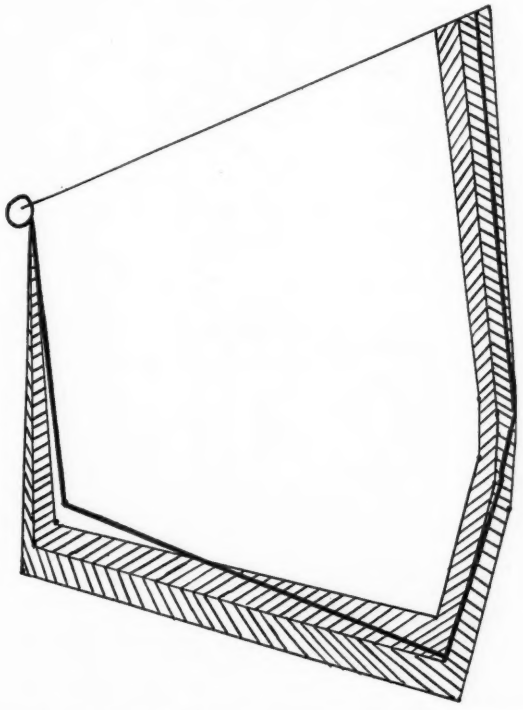

Fig. 16.—Diagram of profile of face showing average and standard deviation with superimposition of an individual of the same group with normal occlusion.

is obtained by the standard deviation within which 68 per cent of the total number of cases must fall. The range of variability emphasizes the fact that not all normal adult faces are exactly alike. They differ from one another. This difference may be seen when the profile of individual faces is superimposed on this figure. This has been done in Fig. 16 which is a diagrammatic representation of the facial profiles of the adult group over which is superimposed one particular skull among them. It should be noted that in all except one feature the points fall within the range of variability. Owing, however, to a relatively short ramus the mandibular angle is more obtuse, falling outside the normal range of variability. From this figure it becomes quite plain that even faces with dentitions in normal occlusion are not quite normal in every particular.

If now a similar figure is constructed from the mean and standard deviation of the 34 skulls of the W. R. U. whites, the dentitions of which are in normal occlusion, and the superimposition of a face with a dentition in Class II, Division 1 is made, an entirely different aspect is obtained. Thus Fig. 17 presents again the mean and standard deviation of the white normal series by the heavy line and shaded areas upon which the profile of a face with the dentition in Class II, Division 1, case of malocclusion is superimposed. In this comparison it is seen in what particulars the abnormal condition differs from the normal. Not only is the middle and lower portions of the face with the entire dentitions further posterior than in the normal, but also the lower dental arch is relatively much further back than the upper. This figure also shows that in Class II, Division 1, the upper alveolar and dental arches are

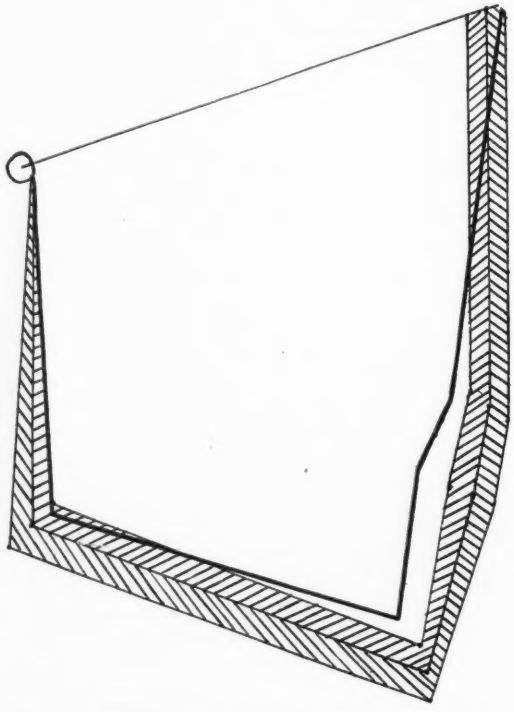

Fig. 17.—Diagram of profile of face of whites (W. R. U.), showing how a Class II, Division 1 case differs from the average normal when superimposed.

not only not too far front than in normal dentitions, but rather too far back. It rather strongly suggests the fact that this Class II, Division 1, condition is due to a state of underdevelopment of the middle face and dentition and that this condition is more emphasized in the mandible and the lower alveolar and dental arches. In the upper region (nasion) on the contrary the face rather shows abundant growth, since nasion reaches the upper extreme in the range of variability of the normal. If in the treatment of such cases certain teeth would be extracted, what would be the effect upon the face? Would it bring the face nearer to the normal or further from it?

This, however, is not the only way in which Class II, Division 1, cases are demonstrable. When the faces of the Hindus are compared, a different aspect may be obtained. In Fig. 18, for example, the diagrams of two faces

with dentitions in Class II, Division 1, malocclusion are superimposed upon the diagram of a group with normal occlusion, the third in the diagram being a skull with the dentition in normal occlusion. The outline of the normal as is seen in the illustration falls within the field of normal variability. In Class II, Division 1, cases, however, the upper dental arch is not behind that of the normal. But it also is not further front than in the normal. On the other hand, in the one the lower dental arch is behind the normal, while in the other it is relatively further back to the upper than it is found in the normal. Furthermore, the one having the lower dental arch further back also has a short ramus and an obtuse mandibular angle, while the other having a longer ramus, the angle is more acute.

Thus the anatomic evidence herewith presented fails to support the assumption that in Class II, Division 1, cases of malocclusion the maxilla and

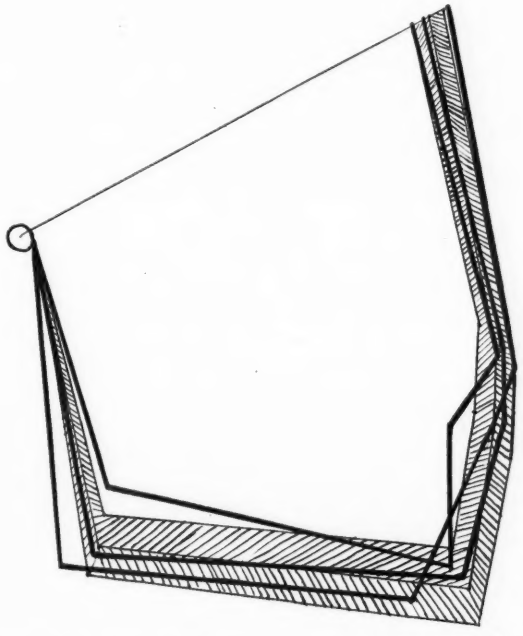

Fig. 18.—Diagram of profile of face of Hindus with superposition of two Class II, Division 1 cases and one with normal occlusion.

the upper dental arch are more anterior than under normal conditions. On this ground there is, therefore, no justification in the extraction of teeth for the purpose of reducing the assumed protrusion of the upper dental arch in Class II, Division 1. On the other hand, the evidence obtained from results of treated cases not only confirm but also lend support to the views derived from anatomy, namely, that in Class II, Division 1, cases of malocclusion the mandible and the lower dental arch are in a relatively posterior position to the maxilla and to the upper dental arch; also that in orthodontic treatment it is not necessary to reduce the supposed forward position of the maxillary dental arch, but rather to help bring forward the mandibular dental arch. This is borne out by the fact that by following this procedure growth is not interfered with since both upper and lower dental arches keep on growing

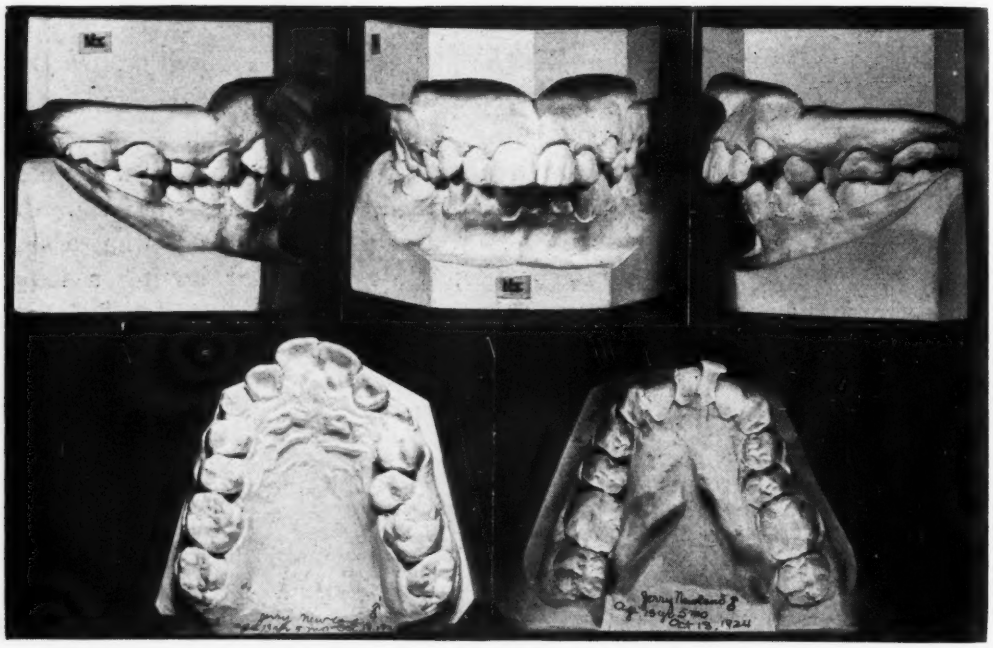

Fig. 19.—Casts of case of malocclusion, Class II, Division 1, *A*, right side view showing distal occlusion; *B*, front view showing excessive overbite and crowding of mandibular incisors; *C*, left side view showing normal mesiodistal occlusal relation; *D* and *E* occlusal views showing malposition of individual teeth and distorted dental arch forms.

Fig. 20.—Photographs of face of case shown in Fig. 19. *A*, front view; *B*, side view, showing position of maxillary incisors between the lips.

or increasing their dimensions anteriorly during and after treatment as long as natural growth is effective.

Figs. 19 to 35 inclusive represent but a small sample of a large number of cases so treated. They are recorded here mainly to prove that the results

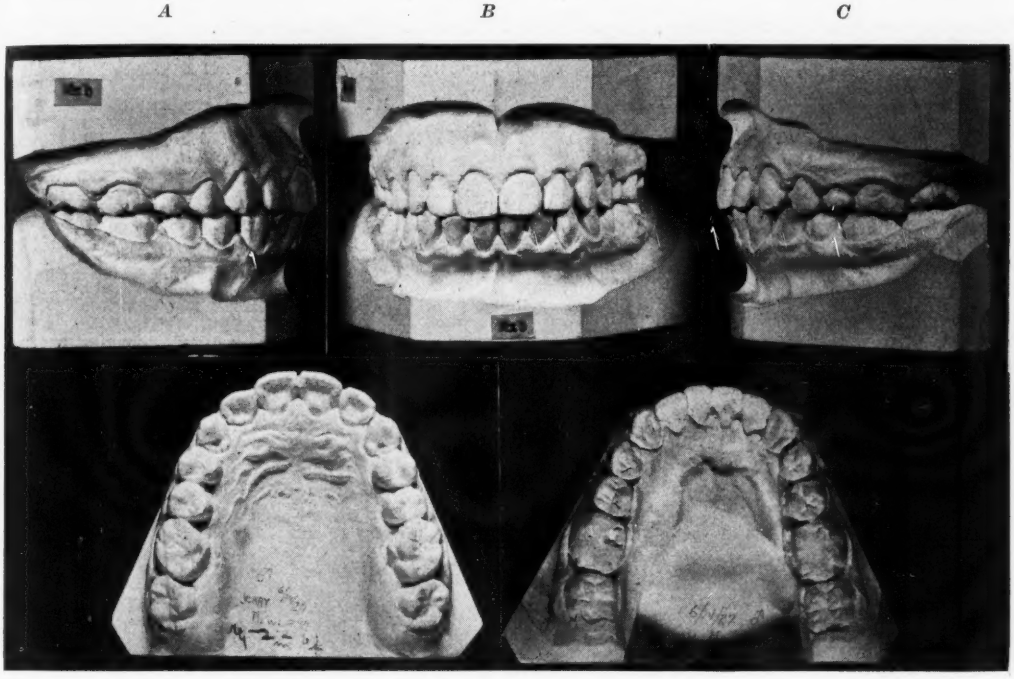

Fig. 21.—Casts showing result of treatment of case, Fig. 19. *A*, right side view showing corrected mesiodistal occlusal relation; *B*, front view showing corrected overbite; *C*, left side view showing improved occlusal relation; *D* and *E* occlusal views showing improved change in dental arch form and positions of teeth.

Fig. 22.—Photographs of treated case of Fig. 20. *A*, right side view; *B*, front view showing change in facial expression due to correction of occlusion and change in position of teeth and lips.

of cases treated without extractions are satisfactory and lasting. Figs. 21 and 22 present the case illustrated in Figs. 19 and 20 one year after the removal of the

retaining appliances. Fig. 23 shows the dentition of Fig. 21 six months later. It is inserted for the purpose of showing how quickly occlusion is disturbed by extracting a tooth. In this instance, the patient had the misfortune of being in the hands of a dentist who extracted the mandibular left molar without giving the matter any further attention. The disturbance in the occlusal relationship on the left side, Fig. 23, *C* and *E*, is quite evident.

In the case shown in Figs. 24 and 25 the second casts and photographs, Figs. 26 and 27, were obtained one year after the removal of the retaining appliances, and Figs. 28 and 29 two years later. The case presented in Figs. 30 and 31 was corrected in about one year. The photographs in Fig. 32 were taken one year later. The casts shown in Fig. 33 were made seven years later, and those in Fig. 34 and the photograph, Fig. 35, fourteen years later.

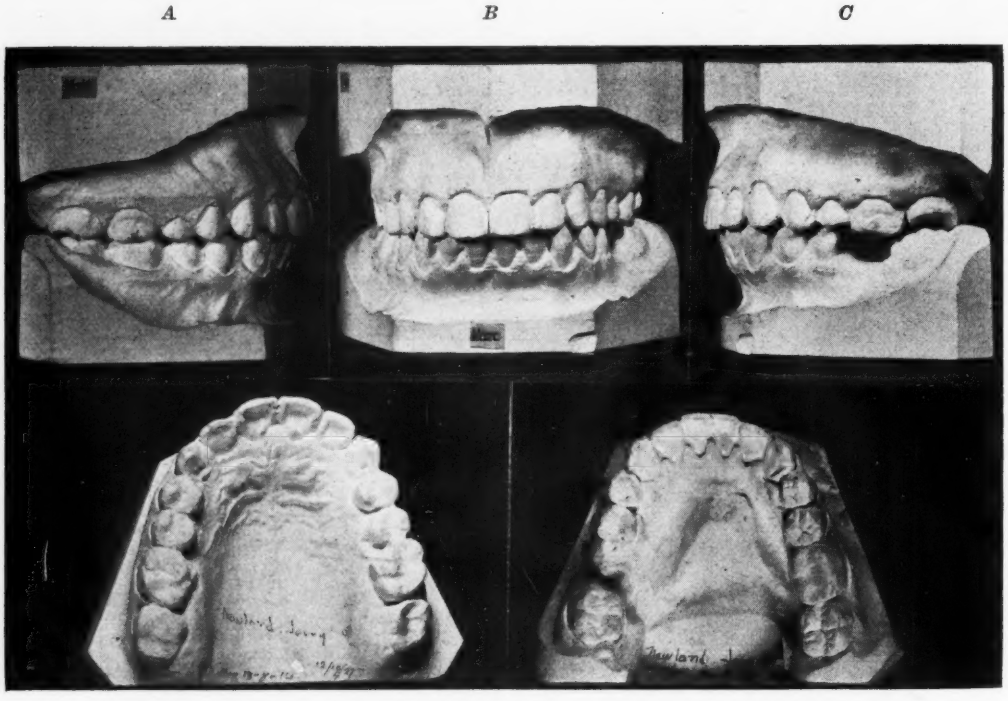

Fig. 23.—Casts of cases, Fig. 19, six months after Fig. 21. Note disturbance in occlusion on left side (*C*) due to extraction of mandibular left first molar.

As will be noticed, no teeth were extracted in the treatment of these cases. I wish to emphasize at this point that in my twenty years of experience in orthodontic practice I have not found it necessary to extract any tooth except perhaps a supernumerary or a deciduous one in any of the cases which have so far been in my care. In the treatment of the cases illustrated, use was made of plain labial arch with certain auxiliary attachments in addition to which intermaxillary elastics were employed. The effect of the results shown by the casts upon the faces of the patients may be seen in the photographs, Figs. 20, 22, 25, 27, 29, 31, 32, 35. The points of greatest interest, however, will be found in the anthropometric records of these cases. Thus, Table III shows four yearly records made of the case in Figs. 19, 20, 21, 22, and 23.

A *B* *C* *D* *E*

Fig. 24.—Casts of case of malocclusion, Class II, Division 1. *A* and *C*, right and left side views showing distal relationship of mandibular teeth; *B*, front view, showing extent of protrusion of maxillary incisors and excessive overbite; *D*, *E*, occlusal views showing asymmetry in dental arch form.

A *B*

Fig. 25.—Photographs of face of malocclusal case, Fig. 24. *A*, side view; *B*, front view; showing abnormal position of lips due to protrusion of maxillary incisors.

TABLE III

ANTHROPOMETRIC RECORD OF POSITION OF FACE (CASE SHOWN IN FIGS. 20 AND 22)

YEAR	1925	1926	1927	1928
Class	II. $\frac{\sim}{+}$	NN	NN	NN
Auriculonasion	92	96	96	98
Auriculo-Pros. Sup.	92	96	95	100
Auriculo-Pros. Inf.	—	93	96	98
Auriculomenton	93	102	105	107
Age	14-1-26	15-1-23	16-0-0	17-1-0

II. $\frac{\sim}{+}$ = Class II, Division 1, protruding upper incisiors, excessive overbite; NN, normal occlusion, normal overbite. Age is indicated in years, months, days.

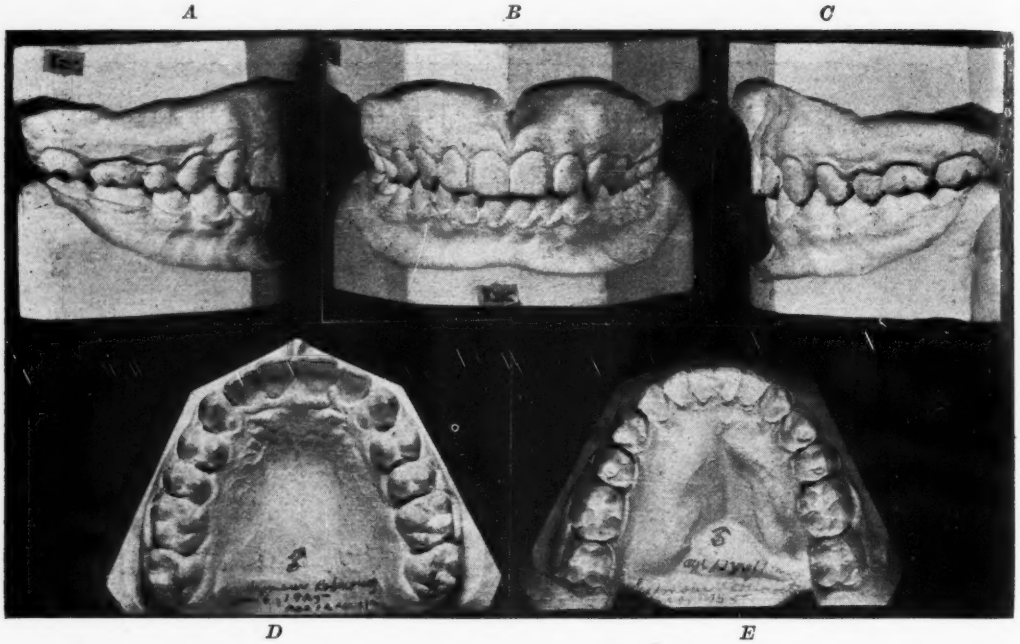

Fig. 26.—Casts of case, Fig. 24, one year after retention was removed. *A* and *C*, right and left side views, showing corrected mesiodistal relation of teeth; *B*, front view, showing corrected position of incisors and corrected overbite; *D*, *E*, occlusal view, showing improved change in dental arch forms and in position of individual teeth.

Fig. 27.—Photographs of face of case, Fig. 25. *A*, side view, *B*, front view, showing improved facial expression and change of mandible brought about by the improvement in the occlusion of the teeth.

TABLE IV

ANTHROPOMETRIC RECORD OF POSITION OF FACE (CASE OMITTED)

YEAR	1925	1926	1927	1928
Class	II. $\frac{\sim}{+}$	NN	—	NN
Auriculonasion	98	101		100
Auriculo-Pros. Sup.	88	94		95
Auriculo-Pros. Inf.	--	92		93
Auriculomenton	100	108		107
Age	15-3-23	16-7-0		18-4-0

II. $\frac{\sim}{+}$ = Class II, Division 1, protruding upper incisors excessive overbite; NN, normal occlusion and normal overbite, N—, normal occlusion, edge-to-edge bite.

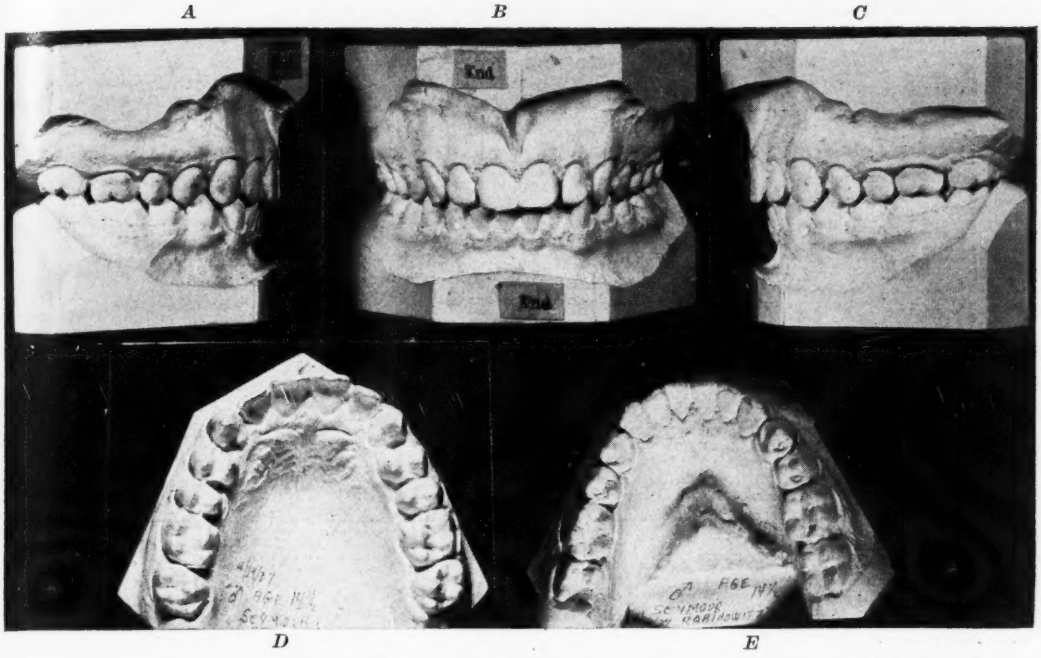

Fig. 28.—Casts of case shown in Fig. 26, two years later, showing no adverse changes to have taken place.

Fig. 29.—Photographs of face two years later than those in Fig. 27. The smiling front view is incidental. It was not staged.

TABLE V

ANTHROPOMETRIC RECORD OF POSITION OF FACE (CASE SHOWN IN FIGS. 25, 27, AND 29)

YEAR	1925	1926	1927
Class	II. $\frac{\sim}{+}$	NN	NN
Auriculonasion	94	96	98
Auriculo-Pros. Sup.	93	97	100
Auriculo-Pros. Inf.	—	95	100
Auriculomenton	107	112	109
Age	12-10-24	13-10-29	14-9-0

II. $\frac{\sim}{+}$ = Class II, Division 1, protruding upper incisors and excessive overbite; NN, normal occlusion, normal overbite.

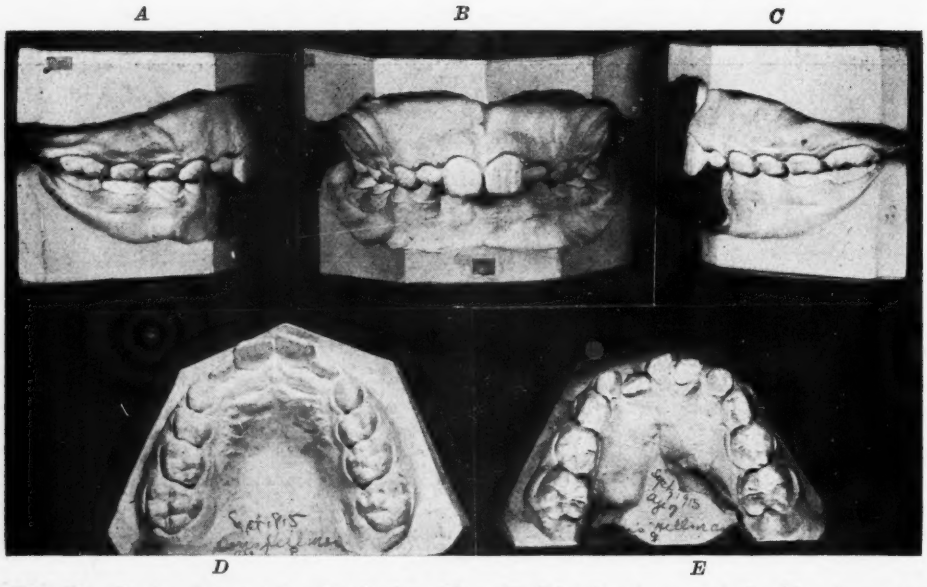

Fig. 30.—Casts of case of malocclusion, Class II, Division 1, *A*, and *C*, side views showing distal relation of mandibular teeth; *B*, front view showing protrusion of maxillary central incisors and laterals in course of eruption; *D.*, *E*, occlusal view, showing symmetrical upper dental arch and underdeveloped anterior part of lower alveolar arch—space for mandibular right lateral incisor completely closed up.

Fig. 31.—Photographs of face of case shown in Fig. 30. *A*, side view, *B*, front view, showing position of incisor between lips.

Fig. 32.—Photograph of face of same case shown in Fig. 31, one year later, occlusal condition having been corrected.

It should be noted that of the dimensions taken all show a gradual increase. This increase should convince one of the fact that, despite the backward pull of the intermaxillary elastics upon the upper dental arch, the

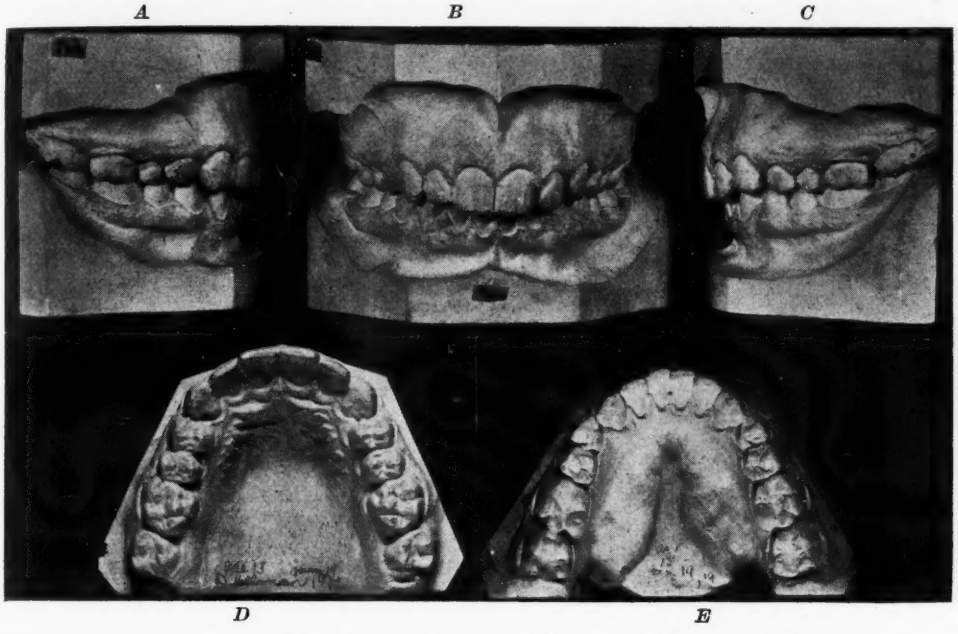

Fig. 33.—Casts of case shown in Fig. 30, eight years later.

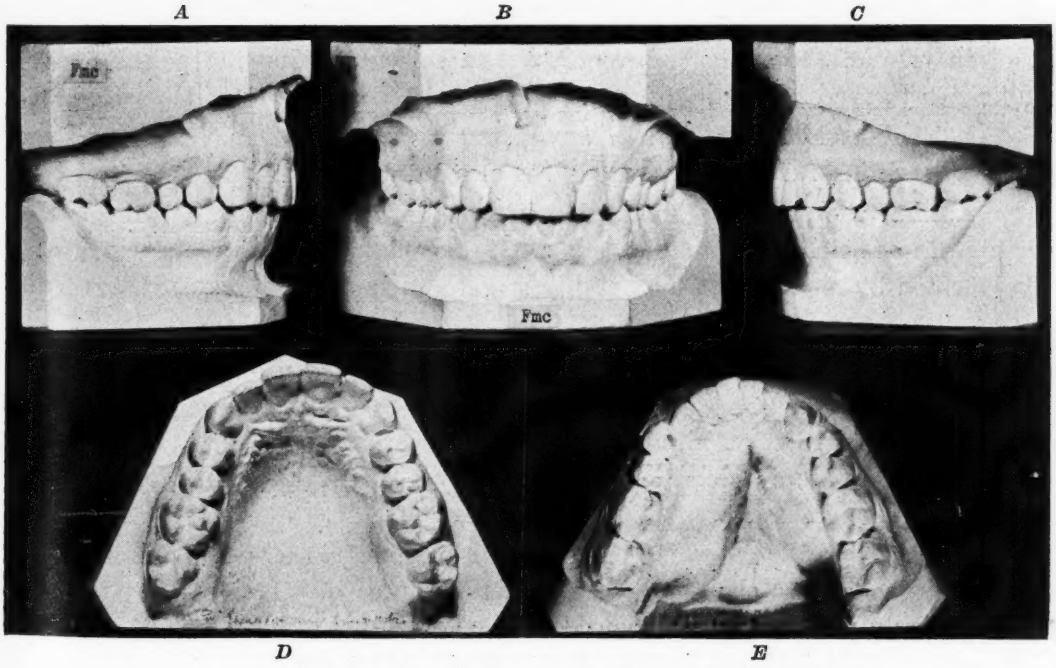

Fig. 34.—Casts of case shown in Fig. 30, fifteen years later.

growth of the maxilla keeps on increasing its dimension anteroposteriorly carrying forward not only the upper but also the lower alveolar and dental arches. This fact is also borne out by the anthropometric records of the two succeeding cases in Tables IV and V. Similar records of the last case are not

A *B*

Fig. 35.—Photograph of face of case shown in Fig. 31, fourteen years later.

available. Of course, this is but a very small sample of a large number of cases thus treated with like results. It, nevertheless, suffices to add another item to the abundance of evidence already massed against the fallacy of the laws, theories, and methods proposed by Simon.

SUMMARY

In view of the evidence brought out in this discussion the points of significance to the orthodontists are as follows:

1. That orthodontia though advancing rapidly has made real progress only in certain branches. In others it is at a standstill.

2. That the principle involved in the theory of the orbital plane or the canine law is not well founded, since it is not supported by facts which can be verified by anyone qualified to investigate the problem in accordance with the method of science.

3. That the treatment of Class II, Division 1, cases of malocclusion as recommended by Simon is wrong and misleading.

4. That the relationship of *orbitale* and the canine point is a highly variable character and differs widely among different races, between the sexes of the same race and among the individuals of the same sex.

5. That despite the variation in this relationship there is a tendency of the orbital plane to shift posteriorly in the course of development from infancy to adulthood. In other words, as the individual grows older, the muzzle projects further forward, leaving the orbital plane behind.

6. That Class II, Division 1, malocclusal conditions may be rather attributed to insufficient and disproportionate development in certain regions of the jaw bones.

7. That the treatment of Class II, Division 1, cases, or any other class of cases for that matter, is not to be looked at from a surgical or pathologic

point of view. It should rather be pursued on a physiologic basis, heeding those processes which are involved in natural growth. However, growth means increase in size; it necessarily entails also the concept of direction. An adequate knowledge, therefore, of development as it affects the human face by increase in size, change in proportion, and alteration in position, is a prerequisite without which the orthodontist is bound to grope about in darkness and confusion.

The material used for this contribution was gathered from many sources, principal among them are the American Museum of Natural History, New York; the Hamann Museum, Western Reserve University, Cleveland, Ohio; and the National Museum, Washington, D. C. To all these institutions I am greatly indebted for the privilege given me of access to their valuable collections. Personal thanks are due to Professor T. Wingate Todd for the incentive to investigate this problem. To my daughter, Edith, I am obliged for her help in preparing the diagrams and charts.

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THE CONSTANCY OF CUSP POSITION AS RELATED TO FACIAL FORM*

By Martin Dewey, D.D.S., M.D., New York, N. Y.

THE DIAGNOSIS of malocclusion is recognized as one of the most important phases in the practice of orthodontia. Malocclusion being a deviation from normal occlusion, it follows as a natural and logical sequence that the relation of the teeth, one to the other, should form an important basis for the classification of malocclusion.

During the last few years considerable criticism has been made of systems of diagnosis or plans of diagnosis, the basis of which has been cusp relation. The earliest attempts made to study malocclusion by relating the teeth of one arch to the teeth of the other arch are not known. But regardless of these early attempts, it was not until Dr. Angle gave to the dental profession the so-called Angle classification that the relation of the mandibular teeth to the maxillary teeth became an important factor in diagnosis.

The Angle classification has undoubtedly been more widely accepted than any other plan of classification and with slight modification it is our belief that the Angle plan, namely, *the relation of the mandibular teeth to the maxillary teeth,* will be more accepted in years to come because it is the most scientific.

During the past few years, we have heard considerable about the gnathostatic diagnosis, the basis of which seems to be an attempt to diagnose malocclusion by relating the denture or the dental arches to certain points on the face and cranium. We are willing to admit that in the final study of dental deformities it is desirable and to a certain extent necessary to know something about the relation of the face to the cranium. However, we find in the study of comparative anatomy and in the study of various races that the relation of the face to the cranium is more variable than the relation of the mandibular teeth to the maxillary teeth. To sum up the question in a few words, we find that the constancy of cusp relation is a much more reliable factor than is the relation of the face to the cranium as indicated by any definite plan of measurement such as the gnathostatic method.

There is no law or rule governing the relation of the face and cranium that is constant according to anatomic and scientific facts, because no such law applies equally to the lower animals as it does to man. The fallacy in gnathostatic diagnosis, as we have been able to observe it, is that the so-called laws and relations of the gnathostatic measurements have been based upon one particular type. Simon's laws do not hold true in all types, and consequently much confusion has resulted. In fact the law of the canine, upon which his system of diagnosis is based, has been disproved so many times that it is needless to mention it here.

*Read at the Twenty-eighth Annual Meeting of the American Society of Orthodontists, at Estes Park, Colorado, July 15-20, 1929.

The constancy of cusp relation, however, not only holds true for man but holds true for the primates and the majority of mammals and even down to the reptiles and fishes. In other words, there has been a definite relation of the mandibular teeth to the maxillary teeth, regardless of face or jaw forms and regardless even of the function of the teeth.

We find very early in the evolution of the dental apparatus that the teeth in response to functional demands were forced to assume a definite relation to each other. We find as face and head forms changed that this constancy of cusp relation was maintained. There is no definite relation existing between the position of the jaws as compared to the shape and form of the cranium. We find that the denture may be placed forward as related to the cranium or it may be placed more posteriorly. Notwithstanding the fact that this different position exists in regard to the denture, cusp relation is the same in each case. This is proved in the different races and also is true of the long-jawed primates as compared with the short-jawed primates. It is also true for the long-muzzled dogs as compared with the short-muzzled dogs.

We can expect nothing else to exist because in the evolution of the cranium and face we find the cranium greatly influenced by the development of the cartilaginous structure known as the chondrocranium, to which has been added the cover bones, the size and form of which have been influenced by the growth of certain bodies and centers which make up the fore-, mid- and hind-brain in conjunction with the various special sense organs such as hearing, seeing and smelling.

We find that the dental apparatus developed in response to the demand for food and consequently has taken on various forms in response to these functional demands. We also find the dental apparatus developed from the so-called visceral skeleton or branchial arches; these arches are closely associated with respiration. In the study of animals that masticate their food, we find respiration, deglutition, and later, articulation, all closely associated with the branchial arches.

Respiration has played a great part in the relation which the denture bears to the cranium, but in spite of the fact that different types of respiration have changed the location of the denture, or food-securing apparatus, in relation to the cranium, the cusp position in relation to the mandibular teeth to the maxillary teeth has remained practically constant.

We find in the primitive fish, such as the shark, the cranial apparatus is small, and what might be called the face is made up almost entirely of the mandible and maxilla dental structures. These dental elements are loosely attached to the cranium and can be very easily separated. They develop quite independently of the cranium. The respiratory functions are performed by the gills. We might say, in passing from above downward, that we find the cranium, the masticating and the respiratory apparatus developing. We also find in these animals a relation of tooth-bearing structure which enables the animal to secure its food.

Through the various species of fish, we find that jaw forms and cranial forms vary, the shape of the teeth vary, but there is a surprisingly constant relation of the mandibular elements with the maxillary elements in response

to functional demands. In other words, we may have long-jawed fishes, as the gar pike and the pickerel, or we may have short-jawed fishes with wide open mouths, as the catfish and large-mouthed bass. But in these greatly varying types there is always a constancy of tooth position but no constancy of dental elements to the cranium in regard to anteroposterior relations. This simply means that a gnathostatic law for a shark would not hold true for the pickerel. But a law based upon the constancy of tooth relation would be accurate and positive in either type.

As we pass to the reptiles, we find the number of teeth have diminished. There is a more constant tooth form tending toward a prehensile tooth of conical type. As the number of teeth are reduced, the constancy of cusp position becomes more noticeable. We now find rows of teeth and the maxillary teeth occupying a definite relation to the mandibular teeth. We find that the relation of the jaws to the cranium has been greatly modified in these air-breathing animals because the respiratory tract has now taken a position between the cranial and dental structures. In fact, we notice that the nasal cavity at the anterior portion of the tract has been modified in the upper portion of the maxillary and was once the upper portion of the oral cavity.

In the beginning of the development of every man, the respiratory tract asserts itself in the form of gill arches. Ordinarily, these structures in the fish develop into complete slits, and the gill arches are concerned with respiration and deglutition. The respiratory structure which is the gill arches in the fish is replaced by a development in the nasal cavity in the air-breathing animals which now occupies a position between the dental and cranial elements. We find, therefore, that the relation of the dental apparatus to the cranial is influenced by the development of the nasal cavity or the anterior portion of the respiratory tract. In fact it may be said that the major portion of the dental elements is attached to the cranium by the anatomic structure which represents and makes up the nasal cavity. It can be said, therefore, that the relation of the dental elements to the cranium has been inflenced and is influenced by the development and growth of those structures pertaining to respiration. We find as a result that jaw forms, tooth forms and face forms have changed very materially from fish to man as Gregory has so nicely brought out in "Our Face From Fish to Man."

During all these years of evolution, the various face forms and different types of respiration have changed, but the constancy of cusp position has remained practically unchanged. In the reptile prior to the marsupial, a development of cusp relation made its appearance and can be traced in the majority of marsupials and mammals to the present time. It is very probable that there were animals developed whose dental apparatus did not follow the same plan of evolution as is found in the tritubercular forms. Most of these animals are known to us only as fossils, but it is very probable that the elephant never developed a tritubercular tooth and that his ancestors did not possess such a dentition. However, we find that the dentition which the elephant has presents a constant relation of mandibular elements to maxillary elements regardless of face or head forms.

The constancy of cusp position as verified in the tritubercular pattern

can be traced through numerous families, orders and species which present many different face forms, cranium forms and jaw forms; but the cusp position is constant. In the two typical forms, the tritubercular and the triconodont, we find the protocone and the protoconid have a definite relation to each other, as have also the metacone and metaconid.

In the tritubercular tooth the protocone develops on the lingual side and the protoconid on the buccal side. We find that as a result of functional demand a talon developed on the distolingual side of the maxillary molar. A talonid developed on the distobuccal side of the trigonid on the mandibular molar which eventually grew to such a size that it is known as the distobuccal cusp, and this carried two cusps known as the distobuccal cusp and the distolingual cusp.

We now find the protocone of the maxillary molar setting in a fossa which is formed by the protoconid, metaconid, the hypoconulid and the mandibular molar. This relation becomes constant while other modifications of tooth forms occur, such as the loss of the paraconid on the mandibular molar, thereby permitting the metaconid to become the mesiolingual cusp; but the relation of the protocone to the fossa of the mandibular molar is not changed.

The next important development in the tritubercular tooth was the growth of the talonid on the maxillary trigone in such a way as to make a four-cusped maxillary molar create an occlusal fossa into which the hypoconids of the mandibular molar fit or are occluded. This constancy of cusp position appeared in the early marsupials. In the opossum the maxillary molar has not as yet developed a talon, and the paraconid can still be seen on the mandibular molar. In fact the first mandibular deciduous molar of man still retains the paraconid as the small mesial cusp.

Through all the millions of years, the constancy of cusp form has persisted, although the shape of the teeth was modified, jaws became long or short, the dental elements were situated further underneath the cranium in response to functional demands, and as influenced by the respiratory and olfactory functions and because of the increased sections of the brain which has modified the shape and size of the cranium.

From the standpoint of anatomy and embryology as revealed by comparative anatomic studies and investigation of evolutionary changes, the cusp position has been more constant than any other part of the facial and cranial elements. We find the development of the cranium has been from the chondro-cranium and the elements of the visceral skeleton. It is not logical to assume that any point on the cranium can be taken as a true point from which to study the development of occlusal relations in different animals. In other words, because the chondrocranium develops to a certain size and direction is no reason why the mandible and maxilla elements should follow a definite and positive law as related to it.

Any attempt to establish an arbitrary diagnosis, as was attempted by Simon in his gnathostatic system, is without scientific fact. The so-called eye-ear plane is not a basis for the development of the denture or dental elements. Embryologically, the cranium, the maxilla and mandible begin to develop separately and independently from each other. They are eventually

brought in close contact by the scheme of evolution; but one factor which greatly influences the development of the face is the development of the nasal tract. Simon in his gnathostatic theory seems to overlook this fact when he says that the canine has a definite relation to the eye-ear plane regardless of the age of the individual.

It has been shown by measurements that were made by different investigators along different lines (Hellman, Todd, Broadbent, Wolfson, Conley) that the position of the canine to the eye-ear plane varies at different ages and in different races. It is also found that this variation in relation to the development of the canine is dependent upon the growth and development of the respiratory elements of the so-called nasal sinus. It has furthermore been shown that the shape of the face changes in the same individual at different ages, as the face changes in the different races, species, families and orders, but the cusp relation remains constant. As a result of these investigations, we find that the denture from the child to the adult travels downward and forward during the active period of development, and during this time has a varying relation to the cranium; but the cusp position is constant.

It is, therefore, our contention that the most positive and constant factor in the development of the face and the denture related to face forms is the cusp position or the relation of the protocone of the maxillary molar to the central fossa to the mandibular molar.

In the study of malocclusion, it is our belief that a more accurate concept of the existing condition can be obtained by first relating the mandibular arch to the maxillary arch and then relating the two arches, by any plane one may desire, to the cranium. Functional demands make it necessary for the mandibular and maxillary teeth to develop in close harmony so that the animal may secure and masticate his food—even as ineffectually as is done by some human individuals today.

The proximity of respiration, articulation and dental elements also makes it essential that the position of the maxillary teeth and the mandibular teeth be closely related.

The constancy of this cusp position even in extreme malocclusion has been demonstrated over and over again by Dr. Stanton with his system of predetermination of arch forms. Hellman, Todd, Broadbent and others have shown that in Class II or posterior occlusion conditions, associated with underdevelopment of the mandible, that the maxillary arch also very often occupies a posterior position to the face and cranium when compared with normal conditions. In anterior occlusion, or Class III cases, the maxillary teeth may be in an anterior position to the face and cranium when compared with normal individuals. Even Simon's gnathostatic system shows such things to be facts. But we contend that cusp position is a much more primitive, evolutionary, anatomic fact and the most important as a diagnostic plan.

Malocclusion can be more accurately treated and diagnosed from cusp position alone than from any other single plan of diagnosis. Any system of diagnosis which fails to place cusp relation as the most important factor is going to be inferior and will not render the greatest service to the profession. We would, therefore, give the following as an anatomic law:

Jaw forms and skull forms with relation to the dental elements and the cranium may change and vary in different orders, families, and races, but the cusp position remains constant. Therefore, cusp position is the most important factor in studying deviation from the normal.

DISCUSSION OF PAPERS BY DR. MILO HELLMAN AND DR. MARTIN DEWEY

Dr. A. E. Scott, San Francisco, Calif.—Our speaker has maintained, and it is generally admitted, that the diagnosis of malocclusion is of the greatest importance in the practice of orthodontics. His paper is replete with valuable information and is obviously the result of extensive research.

It is probably true that some of our orthodontic failures are due to the simple fact that the treatment is based on a mistaken diagnosis. In other words, we are attempting to cope with something of which as yet we know very little. To treat a condition is one thing; to cure it is quite another.

Recently there has been much discussion in some circles as to just what "normal occlusion" really means. Are we to understand the term "normal" to mean perfection or a statistical average? We suppose that all orthodontists, for example, are normal human beings, but few are candid enough to admit they are perfect. Apparently there is much confusion and uncertainty concerning normality and perfection. If we are striving to reach only the average, we had better revise our plans to include something higher and better. When we say "normal occlusion," we probably mean occlusion which is anatomically correct.

For many years most of us accepted Dr. Angle's classification because it was the best available. We were led to believe that the position of the maxillary first permanent molar was always constant. Now, nearly everyone who has treated half a dozen cases knows that the maxillary first molar may wander from one end of the alveolar process to the other. Just what Dr. Angle believes at the present time we do not know, but our understanding is that his forces have been reorganized to make a bigger and better stand on the key ridge. His meetings are in the nature of executive sessions held behind closed doors, and attended only by those supposed to have a superior and ultrascientific attitude toward orthodontics. Simultaneously the mills grind out ribbons and pins by the thousands, which the general practitioner of dentistry is advised to use for the benefit of suffering humanity as well as for the benefit of the manufacturer.

The most important thing about correcting malocclusion is to make the teeth useful. In fact, some of us believe that when we have established a good functional occlusion we have about fulfilled our obligation to our patients.

Viewed from a practical standpoint the Angle classification was so unsatisfactory that almost every one having any connection with orthodontics was constantly complaining of its inadequacy. For instance, if a maxillary deciduous molar was prematurely lost, resulting in an anterior drifting of the maxillary first permanent molar, the case was classed by some as Class II, and by others as Class I. Consequently, almost anything in the nature of an improvement was welcome to the less somnolent members of the profession. So far as we know Simon has not been immodest enough to claim that his method is the latest and best in diagnosis. Whenever progress is made in the world, it is usually made by a minority or a single individual. It is very true that the Angle classification was universally accepted, but only for the lack of something better. If the teeth of both jaws were in good alignment, they were said to be in "normal occlusion" simply because the molar relationship was correct even though they were too far forward, resulting in a double protrusion with the displeasing appearance which usually accompanies such a condition. Because of its many defects, it therefore seems impossible that the Angle classification should long endure. In fact, it has already been relegated to the background by an appreciable number of orthodontists, while many more sit on the fence in order to obtain a better view of the battle.

Our speaker, apparently, would have us believe that because the orbital plane is not constant and exact it has no value. We should save ourselves much valuable time if we could stop searching for something in nature which conforms to our preconceptions. Simon

himself does not contend that the orbital plane is constant. He states that in cases having anatomically correct dentures only 80 per cent have the orbital plane passing through the canine. If cusp position and relationship were the only elements to be considered in making a diagnosis, our work would be greatly simplified, but we now know we can and do have bone deformities as well as dental deformities. Gnathostatic methods have been subjected to a considerable amount of attack, and while they no doubt contain some imperfections, it is felt that they are a tremendous improvement over anything we have had in the past.

In a court of law we presume the accused to be innocent until he is proved guilty. It seems most unjust to condemn years of conscientious work on such flimsy evidence.

Einstein once said that some of his work was due to the fact that he challenged an axiom. Challengers are very necessary, and we should feel very grateful to Dr. Dewey for the position he has taken in this matter.

Dr. Allen E. Scott, San Francisco, Calif.—This was written in reply to Dr. Dewey's paper and not in reply to Dr. Hellman's paper.

I feel that Dr. Hellman has confused the diagnosis with the treatment. Simon's work, as I understand it, was purely on diagnosis. After you have obtained your diagnosis, you can treat it in any manner you desire and in any manner you see fit. You may want to rub the spinal column or the muscles of the neck or to treat it by absent treatment, muscle training, muscle culture, or any other way that you so desire, but the diagnosis should not be confused with the treatment.

Dr. P. T. Meaney, Portland, Ore.—I think it would be a wonderful contribution to some future meeting of this society to have men having had the experience of Dr. Lischer, Dr. Dewey, Dr. Hellman and others, who have spent possibly from fifteen to twenty years in practice, to bring to us the numbers of cases in which they have had failures. I mean cases properly diagnosed as Class II, Division 1 cases showing treatment for as sufficiently long a time as would be practical, properly analyzed with whatever instrument they may have used regardless of whether by the Simon's method or some other, and show us exactly what they were unable to do without the instrument, and thereby classed the case as a failure.

I am taking it for granted that these men have had failures. When I say failures I mean cases which did not retain themselves satisfactorily. I have had some, and I still have them. I am interested in this particular phase of diagnosis. I am eager for this information. I have analyzed Dr. Lischer's work very carefully. I have analyzed Dr. Dewey's expressions in the last few days, and as yet the light is not clear.

It would be of very great interest to me to have Dr. Lischer, Dr. Hellman and Dr. Dewey present cases at some future time which we could all agree were Class II, Division 1 cases which they have treated over a period of time, and in the regular way, and were not satisfied with the result, but by use of the several instruments which they are now using, they are able to bring about a satisfactory balance.

I should like to have them show us those cases under treatment that retain themselves properly without mutilating the cases by any extraction, so that we may gather some concrete information instead of so much didactic discussion.

Dr. G. W. Grieve, Toronto, Ontario.—There is so much variance of opinion in the treatment of this type of case that I do not know whether we will ever come to any definite conclusions.

I have found, and I am sure it has been the experience of a great many of you, that in the treatment of Class II or distoclusion cases after the removal of appliances you get a crowding of mandibular incisors and canines.

I have no doubt but that some of these very beautiful cases of Dr. Hellman's, if we had the casts in our hands, would show some crowding of the mandibular incisors. This crowding is due to a forward drift of the teeth, notwithstanding the constancy of the cusp relationship which Dr. Dewey has brought out.

I feel confident that in many of these cases we have an abnormal forward drift of the teeth, due possibly to many things, but, as I think I said this morning, chiefly to inharmony of muscular pressure, habits, or something of that nature.

I do not see any reason why Class II cases cannot be treated so that in after life we will not have the excessive leaning forward of the mandibular incisors, and possibly maxillary incisors also, and without the characteristic crowding of the former. I believe if we treat these cases properly, we not only have to carry teeth back in the maxilla but also in the mandible in some instances.

A number of years ago Dr. Strang read a paper, which was later published in the *Cosmos*, with illustrations showing definite inclination forward of the mandibular canines, premolars and incisors, and outlined on the casts the position of the roots of some of the buccal teeth. He said he believed the apical ends of those teeth were more nearly in normal position than the crowns were, and the treatment indicated was to tip the mandibular teeth back into normal position.

Lundstrom has also called attention to the fact that the teeth are carried forward of the normal apical base. I believe in treatment, we must carry them back.

Simon's system of diagnosis is valuable in that it has shown in many cases the definite forward drift. I believe that the great majority of distoclusion cases (so-called) are protrusions of the maxillary teeth, and to a certain extent of the mandibular. This, however, was not my belief at one time.

Angle has recently said that in cases of Class II one must not only carry the maxillary teeth back, but in some instances the mandibular teeth also.

In some of these cases there is a short mandible, and in these development or lengthening of the mandible should be obtained.

I believe if we get the teeth back upon what Lundstrom has called the "apical base" we will have permanent retention and the absence of that crowding of incisors. Of course we must carry out the suggestions of Dr. Rogers and others along the line of getting normal muscular balance.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

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CANCER IN AND ABOUT THE MOUTH*

A Study of Two Hundred and Eleven Cases

By Vilray Papin Blair, M.D., F.A.C.S., James Barrett Brown, M.D., and Nathan A. Womack, M.D., St. Louis, Mo.

THIS survey was not undertaken as a basis for any broad conclusions, but rather to check our own work and results. We do not speak of cures, but believe that if we can add one year of healthful, comparatively comfortable activity to the life of a useful man we have made a real accomplishment.

If a patient dies as the result of a sincere attempt to eradicate cancer, it is a bad mark against surgery, but economically it is no disaster. If after complete relief from a mouth cancer, the patient is later carried off by a recurrence in some vital organ, he not only has had the benefit of the extra span of life, but has also been spared a much worse form of death, namely, from uncontrolled cancer of the mouth.

This presentation is facilitated by assuming the following growth sites, but these regional distinctions were noted chiefly because of their relation to treatment, plan of operative attack and prognosis.

Cancer does not love rules, but it has preferences of location which in turn seem to influence direction of growth and, to some extent, quality of malignancy. Extension will occur from one area to another, but the site of the primary appearance here defines the location. There seem to be some general tendencies as to the direction in which the extension will occur.

The anatomic locations are (1) buccal cavity mucosa, (2) lip, (3) tongue and floor of the mouth, (4) face, (5) pharynx and tonsil, (6) neck, and (7) accessory nasal sinuses and nasal passages.

*From the Department of Surgery of Washington University School of Medicine, St. Louis, Mo.

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(1) *The buccal cavity mucosa* group includes growths of the gums and palate, often classed as cancer of the jaw, a classification that we disregard because of bone involvement is accidental and only incidentally influences the plan of attack.* Metastatic carcinoma of the jaw has been noted three times, once from the rectum and twice from the breast. This buccal cavity mucosa division also includes those growths which have originated from within but have perforated the cheek.

(2) The true *lip* cancers arise from the exposed vermilion border. In this group are included those cases which came to us with healed lips, the result of operation, radiation or pastes, but with metastatic growths in the neck. These have been fairly frequent, and there have been some patients who, when questioned, at first failed to remember that they had had a sore on the lip treated years previous to the appearance of the growth in the neck.

(3) *Tongue,* both oral and pharyngeal parts, and *floor of the mouth.* Growths of the floor of the mouth are grouped with the tongue, on account of both the frequency of the double involvement and the therapeutic indications. The floor of the mouth is less frequently involved from the gums than from the tongue; and further, a growth on the gum is usually destroyed with a soldering iron, while the tissues of the involved floor of the mouth or tongue demand deep removal or radiation. From the tongue a growth may extend widely into the cheek, fauces or pharynx, usually invading these tissues behind the alveolar process.

(4) *Face,* squamous-cell carcinomata arising from the skin, not including growths perforating from the deep structures.

(5) *Pharynx and tonsil,* growths arising in the oral pharynx.

(6) *Neck,* including tumors arising deep in the neck in patients in whom no primary site could be found. Treves pointed out the possibility of primary neck growths arising from epithelial remnants, but our observations are leading us to an increasingly strong belief that the majority of them are metastatic from unrecognized growths in the upper alimentary or respiratory tracts.

(7) *Accessory nasal sinuses and nasal passages,* together with the nasopharynx.

We have also found it convenient to distinguish four arbitrary stages of growth as noted at the first examination. (1) *Early:* Growths of relatively short duration and where there is no gross evidence of glandular involvement. These are frequently small enough for apparently complete excision for the biopsy. There were only ten in this stage out of a total of two hundred and eleven cases. (2) *Medium:* More active growths, still not of great size nor involving tissues difficult to eradicate. Many of these patients have enlarged regional glands. Grades I and II are regarded as belonging to the likely curable class. There were thirty-five in this stage. (3) *Advanced:* This stage includes growths which from their size or from the tissues involved render the treatment more hazardous and the prognosis distinctly less promising. There were one hundred and seventeen in this stage. (4) *Inoperable:* Growths too far advanced for any prolonged relief to be expected, regardless of the type of

*The paradental epithelial cell remnants (paradental débris of Malassez) may possibly be the starting point of some malignant growths, but we have found no definite evidence on this point.

treatment. A few are included in this stage because of physical disability, aside from the carcinoma. Radiation in some form was used on most of these patients. There were forty-nine in this stage.

Although there can be no fixed lines demarcating any two stages, this classification has proved of practical use, as it gives a basis for prognosis from clinical findings. The size, the duration, the rate of growth, the histology, and the condition of the patient are all given consideration in summing up the prognosis and in planning treatment. No one criterion has been found to offer a basis of prognosis accurate enough to present a percentage plan to the patient of his chances of life.

Some of the advanced and inoperable cases have not had biopsies; and in a few others, the microscopic sections were not available. An attempt has been made to grade these growths according to Broder's classification (Figs. 20, 21, 22, 23). In some cases several slides have been studied; the ones from the biopsy, those from the specimen at the operation and those from the regional glands. In some of the earlier cases, biopsy was rather avoided for fear of spreading the disease, but we now feel strongly that there are advantages in the pretreatment microscopic study that outweigh the dangers. By the total removal of small growths, or by the use of the cutting cautery for biopsy combined with radiation, the dangers of implantation must be materially reduced.

Throughout this series, an attempt has been made to correlate histology with the other factors, taking into account cellular differentiation, mitoses and the distribution of the cancer cells; but individual ideas influence microscopic grading perhaps much as they do in determining clinical stages. While it may be claimed that one cell or a small group of cells may prove malignancy, various stages of differentiation may often be demonstrated in a single section. This necessitates a fairly thorough examination and final balance of the differentiated and undifferentiated cells in determining the group. In spite of these uncertainties, it would appear quite certain that there is a definite relationship between the stage of cellular differentiation and the virulence of the individual growth. Therefore, this latter has a bearing on the prognosis and on the character and extent of the treatment.

Our clinical observations over a much larger series have led to the rather definite conclusion that many growths are for a time held in relative abeyance but later take on much more rapid growth, if not a real increase in malignancy. The opportunities to make early and late microscopic examinations on the same growth are relatively rare, but this series shows a higher percentage of growths of Grades III and IV in the advanced and inoperable cases than in the early and medium cases. In drawing this conclusion, changes of only one degree were not considered of worthy note (Table I).

We have observed a type of growth that occurs in the mouth that very closely resembles cancer in its clinical progress and its outcome, but in which repeated microscopic examinations do not show the typical breaking through of the epithelial cells, which is considered necessary in the definition of cancer. These might rightly be considered as a precancerous stage, and in several a breaking through of the cells has been demonstrated in a very small area of

a relatively large growth. However, several have grown for long periods of time, have attained large size and have accomplished great destruction without any breaking-through being demonstrated. (Case I.)

When carcinoma could be demonstrated in the glands, the degree of malignancy nearly always approximated that of the primary growth. The glands were graded one grade lower seven times, one grade higher four times, and two grades higher one time. Glandular metastases appearing long after the apparent eradication of the primary growth were practically always of the third or fourth grades and, where the data was available, were found to have come from growths of original high malignancy. No malignancy was found in forty-nine out of one hundred and thirteen gland examinations; but this does not necessarily mean that these glands were not affected. When

TABLE I

STAGE	EARLY				MEDIUM				ADVANCED				INOPERABLE			
GRADE	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
Buc. cav.				2	7	2	1	1	4	17	7	7		2		4
Lip		2	1		3	3			3	3	4	7				2
Tongue	1			1		2	2	2	1	6	9	7		1		1
Face	1				1	1		1	2	1	1	4				1
Pharynx									1	1	2	2				5
Neck							1			1		4				4
Antrum								1				6		1		1
	2	2	1	3	11	8	4	5	11	29	23	37		4		18

Total graded—158: Grade I—24
Grade II—43
Grade III—28
Grade IV—63

STAGE	EARLY	MEDIUM	ADVANCED	INOPERABLE
Buc. cav.	2	16	41	17
Lip	3	6	20	6
Tongue	3	7	25	7
Face	2	4	11	1
Pharynx			8	6
Neck		1	5	8
Antrum		1	7	2
	10	35	117	49

Total—211

cancer was microscopically demonstrated in the glands, there were seven Grade I, nine Grade II, fourteen Grade III, and thirty Grade IV. Of five that were not graded, one was a very malignant adenocarcinoma from the only adenocarcinoma of the tongue in the series. (Table II.)

In most cases, the glands were removed by radical block dissection. The failure to demonstrate metastases microscopically does not mean necessarily that there was no glandular involvement. Results are, of course, better in the group where no carcinoma was demonstrated, but there are cases in the series which show that undifferentiated carcinoma, even affecting the glands of the neck, is not an absolutely hopeless situation. However, these cases call for the most extensive removal. See Cases 2 and 10. There were seven Grade III cases that had glandular metastases still alive three, four, seven, seven, eight, eleven and twelve years after treatment; six Grade IV after

TABLE II

The grade of the metastatic growth rather closely followed that of the primary tumor.
Of 114 gland examinations, 65 were found to be carcinomatous.
Of 65 glands with positive carcinoma, 60 were graded.
Of the 60 graded metastases:

7 were Grade I—Of these:	6	came from Grade I primary growths;
	1	from a Grade II growth.
9 were Grade II—Of these:	7	came from Grade II primary growths;
	2	from Grade III growths.
14 were Grade III—Of these:	1	came from an ungraded primary growth;
	1	from a Grade II growth;
	8	from Grade III growths;
	4	from Grade IV growths.
30 were Grade IV—Of these:	8	came from ungraded primary growths;
	1	from a Grade II growth;
	3	from Grade III growths;
	18	from Grade IV growths.

1 undifferentiated growth in a lymph node came from a primary adenocarcinoma of the tongue.

4 were not graded—2 from ungraded growths;
2 from Grade II growths.

In 49 glands, no carcinoma was found. Of these:

1	was	from an adenocarcinoma of the cheek;
7	were	from ungraded growths;
9	were	from Grade I growths;
15	were	from Grade II growths;
8	were	from Grade III growths;
9	were	from Grade IV growths.

TABLE III

LONGEVITY RELATIVE TO LYMPH NODE INFECTION

GRADES	NO CARCINOMA	I	II	III	IV
Alive 1-5 years	17	2	2	2	5
Alive 5-12 years	10		1	5	1
Postoperative deaths	6	2	1	4	7
Treated cases, dead later	8	2	3	1	5*
Treated cases not traced	7	1	2	2	1
	48	7	9	14	19

*One suicide.

one, one, two, three and a half, four and seven years; and one Grade IV case that lived three years before a recurrence. (See Cases 2, 3, 4, 5, 6, 7, 8, 9. Tables III and IV.)

The results of treatment can best be shown in tabulations. There is a very high operative mortality, an average of 21.5 per cent according to the number of patients. In this series, one hundred and eighty-nine major operations were done on one hundred and thirty patients. All but one of the postoperative deaths occurred in advanced cases where very radical operations were done, and the growths in nearly all of the cases were poorly differentiated ones. It seems that the farther back in the mouth and pharynx the operation is carried, the higher the mortality. This may be due in part to the increased inability to get rid of mouth secretions, either externally or

by swallowing, which predisposes to respiratory infection. Stamina on the part of the patient and constant efficient attention by the nurse do make for better results. Some patients fail to give any help of themselves. When tracheal tubes are in place, expulsive coughing occasionally through the day will do more to clean out the trachea and bronchi than anything else; but it has been impossible in some instances to keep the airway clean by any

TABLE IV

LONGEVITY RELATIVE TO STAGE AND GRADE OF PRIMARY GROWTHS

	STAGE			GRADE			
	EARLY	MEDIUM	ADVANCED	I	II	III	IV
Alive 1-5 years	2	12	23	8	8	6	8
Alive 5-12 years	3	9	8	4	7	5	1
Postoperative deaths	1		28	3	3	8	11
Treated cases, dead later	1 suicide		32	4	8	6	13*
Treated cases not traced	3	8	11	5	8	2	6
	9	29	102	24	34	27	39
Per cent cured or well	66	72.4	32†	50	43	40.7	23

*Eight refused treatment or went elsewhere for it.

†Forty-three per cent of the postoperative deaths are not counted.

Twelve more patients have been added to the 1-5 year group since this table was made.

means, including suction. Radiation temporarily to stop the salivary flow has been considered but not tried so far; because, in spite of the annoyance of it, it often seems to be the one thing that keeps the total secretion movable so that it can be gotten rid of. Death occurred nineteen times from pulmonary complications, three times from cardiac complications, three times from hemorrhage. Of four cases in which the common or internal carotid artery was tied, four died. Two of these, however, apparently died of pneumonia. (Table V.)

Of the treated early cases, 66 per cent are supposed to be cured. Of the treated medium cases, 72.4 per cent are alive; and of the treated advanced cases, 32 per cent are known to be alive and without known recurrence. Of those advanced cases that survived operation, 43 per cent* are still alive.

The percentages of living patients without known recurrence, with growths of Grades I, II, III and IV, are 50 per cent, 43 per cent, 40.7 per cent and 23 per cent respectively. Untreated cases do not figure in these percentages, but those lost track of are counted. No reports could be obtained on forty-one patients. Of these, twenty-eight are probably dead and thirteen are possibly alive.

There are seventy known deaths other than the postoperative ones. Of these, thirty-four had been treated by operation and radiation and thirteen by radiation; sixteen refused treatment or were sent home for radiation, seven were untreated. Subsequent death from cancer is recorded in twelve or fifteen cases. All but three of these cases were advanced or inoperable, and there were four Grade I growths, ten Grade II, seven Grade III, and twenty-one Grade IV.

*Most of the late reports on the patients have been obtained by the social worker on the surgical service.

TABLE V

Postoperative deaths		29
Stage of growth		28 advanced
		1 early
Grades:	Grade I	3 cases
	Grade II	3 cases
	Grade III	8 cases
	Grade IV	11 cases
	Ungraded	4 cases

Cause of death:

Pulmonary complications	19
Cardiac complications	3
Secondary hemorrhage	3
Common or internal carotid ligation (2 from pneumonia)	4

Death occurred from 1 to 42 days after operation.
Average time of death—10½ days after operation.

	TOTAL CASES	RADICAL OPERATIONS	NECK DISS.	P.-OPER. DEATHS		TOTAL NO. OPER. AT SEPAR. TIMES
				NUMBER	PER CENT	
Buccal cavity	76	53	44	14	26.5	76
Lip	35	22	21	2	9.0	31
Tongue	44	26	23	7	26.9	42
Face	18	12	4			14
Pharynx	14	8	6	3	37.0	10
Neck	14	6		2	33.0	6
Antrum	10	8	1	1	12.5	10
	211	135	99	29	21.5 (Average p.-oper. death rate)	189*

*The postoperative death rate according to the number of operations is, of course lower than that according to the number of patients.

CASE 1.—Male, fifty-nine years old, white. Three years before admission the patient's lips became painful and reddened, and he noted a lump in his cheek. One year ago, lips and growth on right cheek became worse. He was given elsewhere four radium treatments and "electric destruction" three times.

Upon admission, the epithelium of the lip was found to be reddened, thinned-out, cracked and painful. There was a widespread, smooth leucoplakia over the right cheek as far back as the molar region. In the molar region, there was a papillomatous ulcer 1.5 cm. in diameter. The edges were firm and everted, but not as hard as are usually seen in cancer. The process extended into the upper fornix, and because of thickening and an abscess deep in the cheek, the mouth could not be opened more than 1.5 cm. On the outside, there was a dome-shaped induration over the center of the cheek with a small opening draining pus from deep within the cheek.

The specimen removed showed a verrucous growth 1.5 cm. in diameter. The borders were fairly well demarcated, but were found to extend down into the ulcerated area in the cheek. The microscopic picture resembled a benign papillomatous growth rather than a true cancer, as may be seen in the microphotograph. It was because of this picture that three biopsies were done before radical operation was instituted. (Fig. 1.)

CASE 2.—Male, forty-six years old, white. The patient noticed a small tumor in the floor of the mouth three months before his admission to the hospital. He had received no treatment.

Examination showed a smooth, flat ulcer in the left side of the floor of the mouth, not more than 1 cm. in diameter. No enlarged regional lymph nodes were felt. Without previous

biopsy, because he had learned to regard this clinical picture as denoting high grade malignancy, an excision of half of the tongue was done, followed four months later by a left neck dissection. Two years later a right neck dissection was done, on account of recurrence on this side. The photographs were taken seven years after the first operation, and show the extremely radical neck dissections that are done on these cases. (Fig. 2, *A* and *B*.)

Pathology.—The type of growth this tumor illustrated may be seen in Fig. 3. The cancer cells are very poorly differentiated and mitoses are abundant. The primary growth

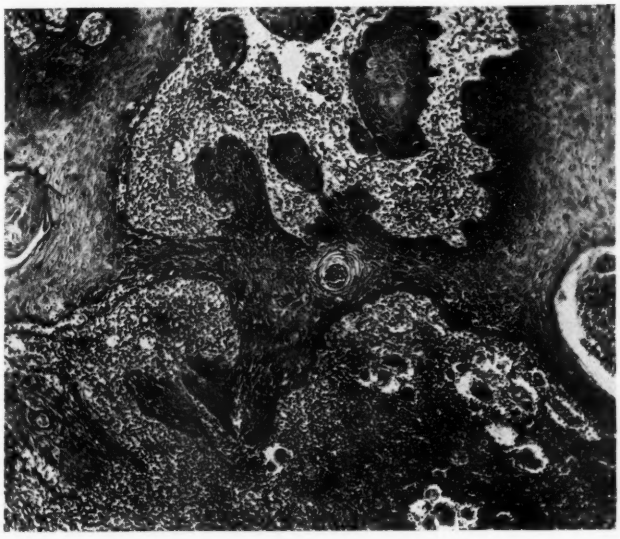
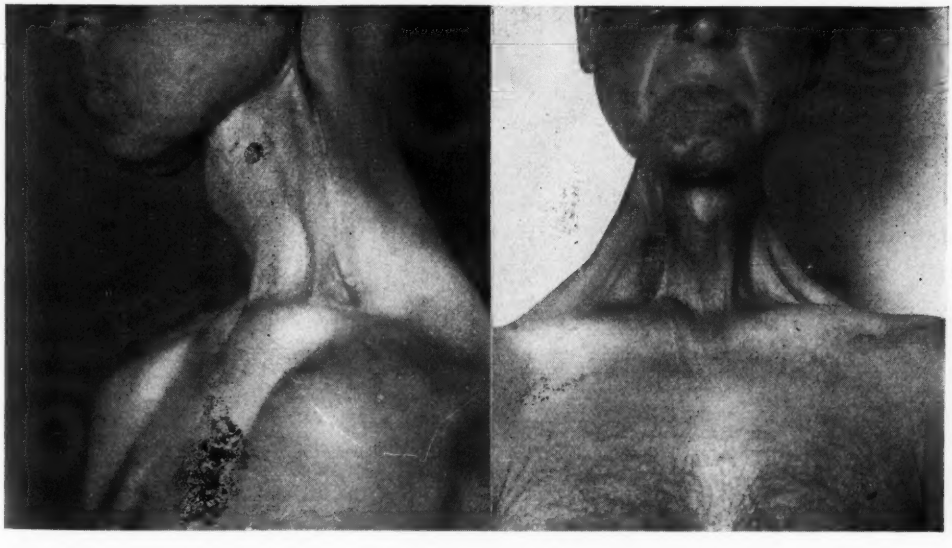


Fig. 1.—Case 1.



A *B*

Fig. 2.—*A*, Case 2; *B*, Case 2.

has been given a Group 4 grading. In Fig. 4, taken from one of the regional glands, there are two areas distended with cancer cells and surrounded by adenoid tissue. Mitoses are not as frequent as in the initial lesion, but even here differentiation is not especially good. From a study of this and other areas, the gland metastases have been given a Group 3 grading.

Case 3.—Male, fifty-one years old, white. One year before the patient was seen, he noticed a blister at the muco-cutaneous border of the right lower lip near the angle. Four months later a mass appeared beneath the right jaw.

Examination showed an ulcer at the corner of the right lower lip 2 x 1 cm. The ulcer was shallow, with a dry, gray base and with hard everted edges. A right submaxillary lymph node was very large, hard and movable.

A right neck dissection was done, with a large V-shaped excision of the ulcer. The patient is well now, eleven years after the operation.

Pathology.—Fig. 5 is taken from the primary growth. There is abundant keratinization present. The marked inflammatory reaction present is perhaps due to the proximity of the ulcer, Grade III. Fig. 6 is from one of the regional lymph glands. The normal architecture of the gland has given way to the extensive carcinomatous proliferation. Differentiation is not as complete as in the primary lesion. There is practically no hyalinization and numerous mitoses may be seen. Fairly extensive fibrous tissue proliferation is present. This gland has been graded III.

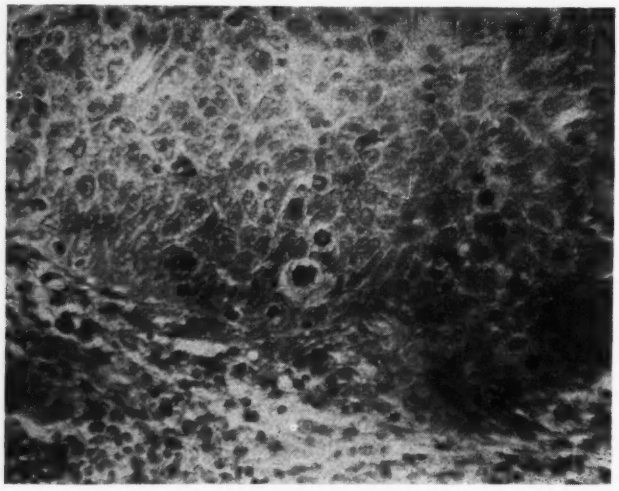


Fig. 3.—Case 2.

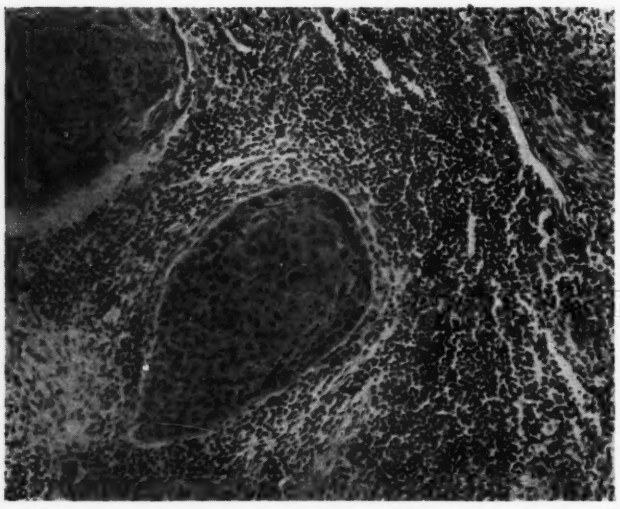


Fig. 4.—Case 2.

CASE 4.—Male, fifty-six years old, white. Three and a half years before admission into the hospital, the patient noted a small ulcer beneath the tip of the tongue. This was excised locally and was said to have been diagnosed microscopically as a benign lesion. There was a recurrence within two months. For the last nine months before admission, there had been considerable bleeding and pain.

Examination showed a large ulcer involving the entire undersurface of the tongue and a portion of the floor of the mouth on the right side. The edges were hard, everted, tender, and bled easily upon manipulation. There was a mass in the upper left part of the neck fixed to the jaw.

Following a low tracheotomy, there was simultaneous bilateral upper neck dissection and removal of the tongue and floor of the mouth, and deep cauterization of the body of the mandible.

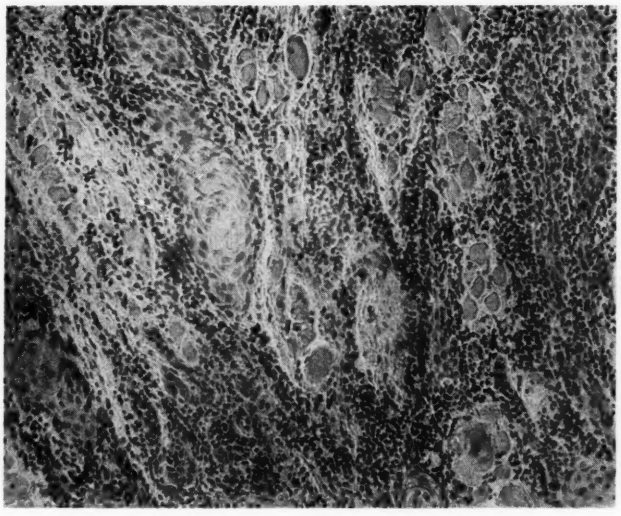


Fig. 5.—Case 3

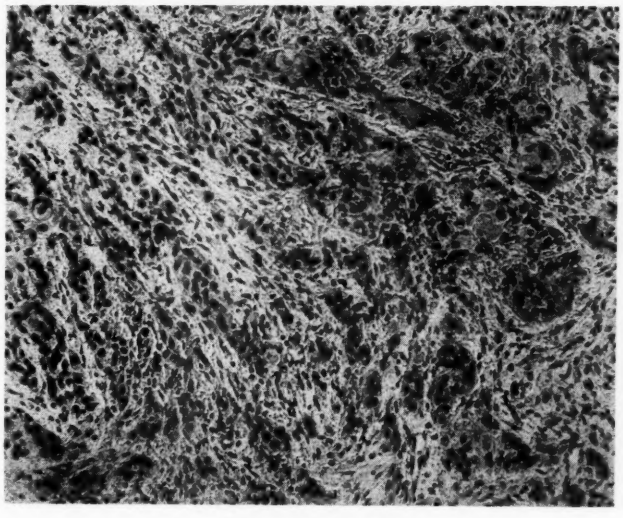


Fig. 6.—Case 3

Seven years later, a new focus developed in the larynx that apparently was unrelated to the previous growth. In spite of treatment, the process extended deep in the neck.

Pathology.—In Fig. 7 very little hyalinization is seen. In spite of the spindle shape of the cells seen in this area, this tumor has been given a Grade III. Other areas from the tumor showed even poorer differentiation with marked invasive properties. Fig. 8 shows an early metastasis to a regional lymph gland. The clear cancer cells may be seen surrounded by fairly normal lymphoid tissue.

CASE 5.—Male, forty-eight years old, white. The patient had noticed a lump on the tongue five years previously which was then excised. He sought treatment for a recent recurrence.

Examination upon admission showed a hard, red, ulcerated area involving most of the upper surface of the tongue. The edges were everted and showed a tendency to bleed. The tongue was hard, swollen and tender. There were palpable glands in both submaxillary triangles.

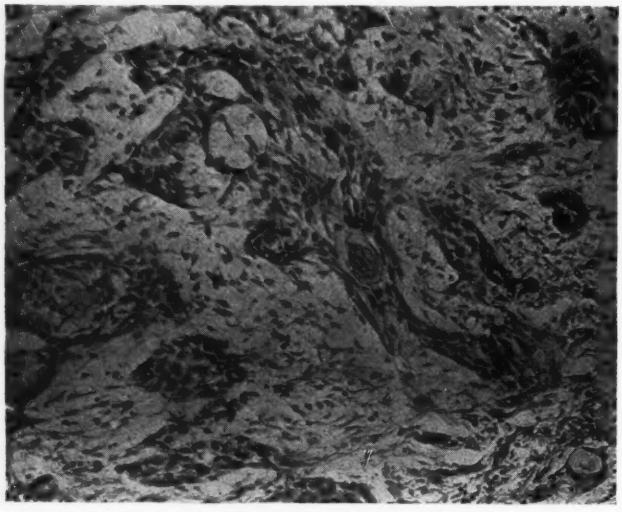


Fig. 7.—Case 4.

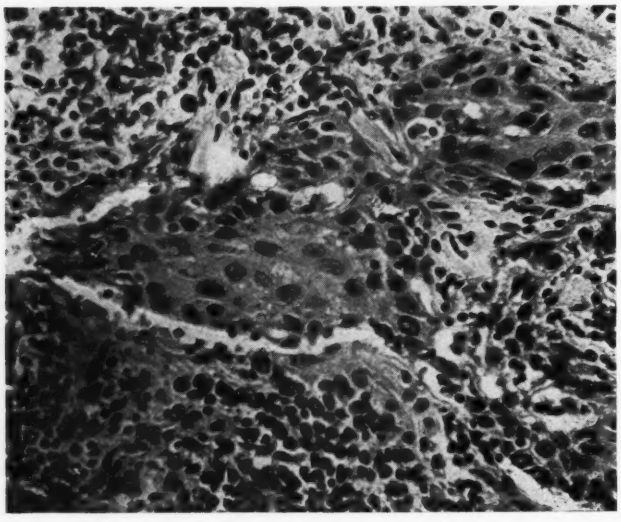


Fig. 8.—Case 4.

A tracheotomy was done followed by a complete removal of the tongue with an upper neck dissection on both sides. The patient returned at later dates for lower neck dissections on both sides, and for excision of a small nodule just above the clavicle that proved to be inflammatory in origin. The patient is well now and able to continue his profession as a physician twelve years after the operation.

Pathology.—Fig. 9, from the primary growth, shows good differentiation of the carcinoma with tendency toward pearl formation. There is a widespread inflammatory reaction due, no doubt, to the proximity of the area seen here to the ulcer. Grade II.

Fig. 10 shows early invasion of a regional lymph node. Differentiation is not quite so good as in the primary lesion. The large pale cancer cells may be seen surrounded by adenoid tissue containing dilated lymph spaces. Grade III.

CASE 6.—Male, fifty-five years old, white. One year before this patient entered the hospital, he noticed a small area beneath the right ear that became scaly, increased in size and ulcerated. Plasters were applied. The mass continued to grow.

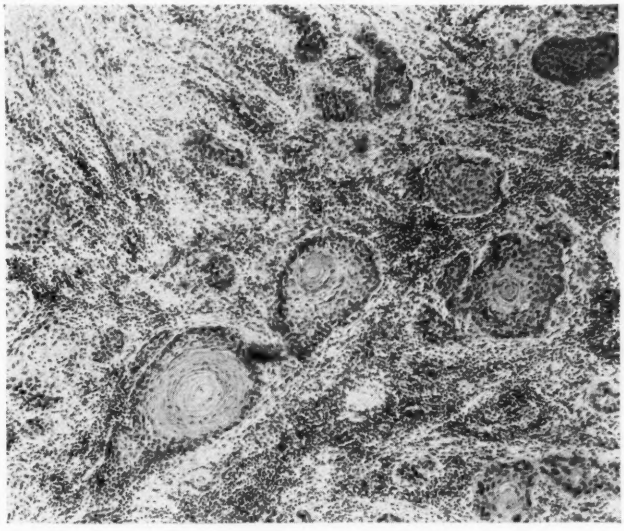


Fig. 9.—Case 5.

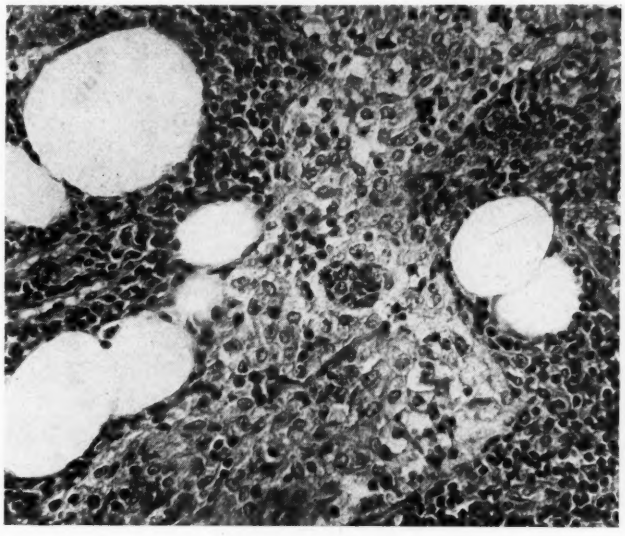


Fig. 10.—Case 5.

Examination showed a cauliflower ulcer below and involving the lobe of the right ear. The ulcer was 3 cm. in diameter, and its base was formed by the mastoid bone and the sterno-mastoid muscle.

The patient had a cautery dissection of the upper part of the right neck, including the parotid gland.

Pathology.—Fig. 11. Differentiation is poor. There is considerable anaplasia present. Mitoses may be seen. Cell outline is in many places indistinct, giving the appearance of a

syncytial arrangement. Grade IV. This patient has had no recurrence following the primary excision of the tumor, four years ago.

CASE 7.—Male, forty-five years old, white. Onset one year before admission, with hard, painless nodule back of ear. This soon ulcerated. Several plasters were applied. The growth increased rapidly in size. X-ray therapy was given. Since then, there has been considerable pain.

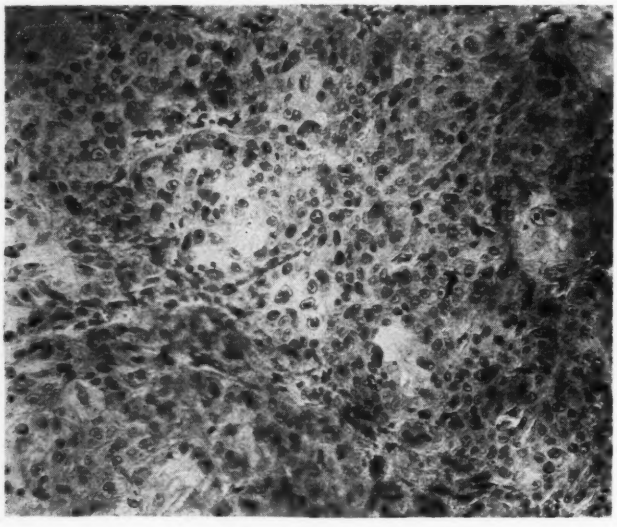


Fig. 11.—Case 6.

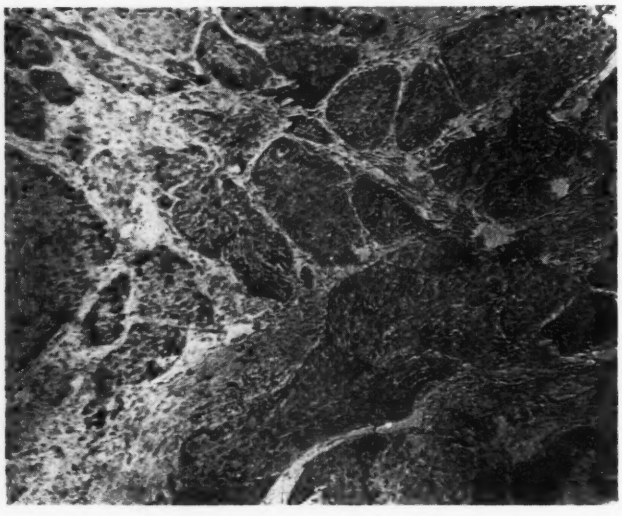


Fig. 12.—Case 7.

Upon examination an oval ulcer 2½ x 2 cm. was noted back of the left ear with a rolled, hard border and about 5 mm. in depth. There were palpable lymph nodes on both sides of the neck. There was a generalized hyperkeratosis of the skin.

The patient had a complete left neck dissection with removal of the parotid gland, and is well now, three and a half years after the operation.

Pathology.—Fig. 12. There are masses of carcinoma cells surrounded by a dense fibrous tissue stroma. Here and there spindle cells may be seen, but from a study of the section

as a whole this tissue has been given a Grade III. Sections from the glandular metastases not shown here present approximately the same picture.

CASE 8.—Male, sixty-four years old, white. Fourteen months before we saw this patient, he noticed that his throat was becoming sore and that the tonsil on the right side was red. He had received no treatment.

Upon admission to the hospital, the right tonsil and anterior pillar were found to be almost completely destroyed by a dirty ulcer extending up to the hard palate. There was an enlarged gland in the anterior triangle of the right side of the neck.

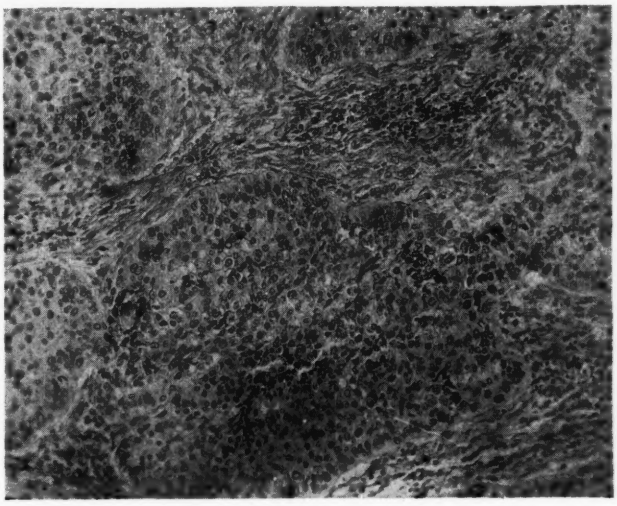


Fig. 13.—Case 8.

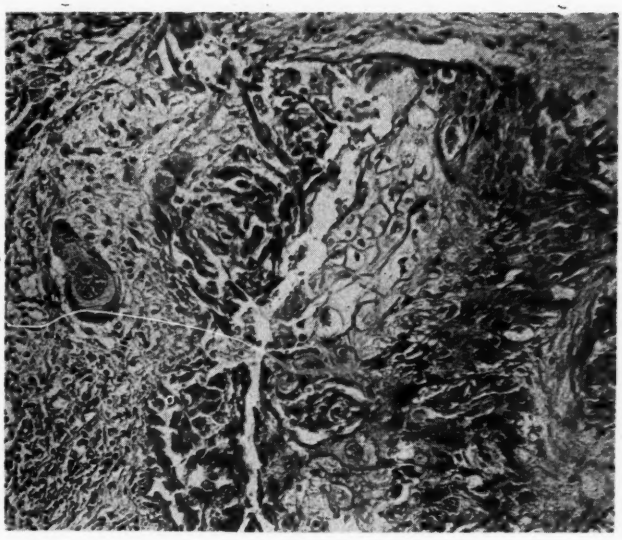


Fig. 14.—Case 9.

Radium therapy was followed by a complete neck dissection on the right side. Several weeks later, following a tracheotomy, a radical excision of the tumor was done along with excision of one-half of the tongue. This was followed by further radium therapy. He is well now, seven years after the first operation.

Pathology.—Fig. 13. In spite of very definite cellular outline, there is no prickling or hyalinization. In other areas, the resemblance to squamous cancer is still less. Very little stroma is present. This cancer has been given a Grade IV.

A *B*

Fig. 15—*A*, Case 10. *B*, Case 10.

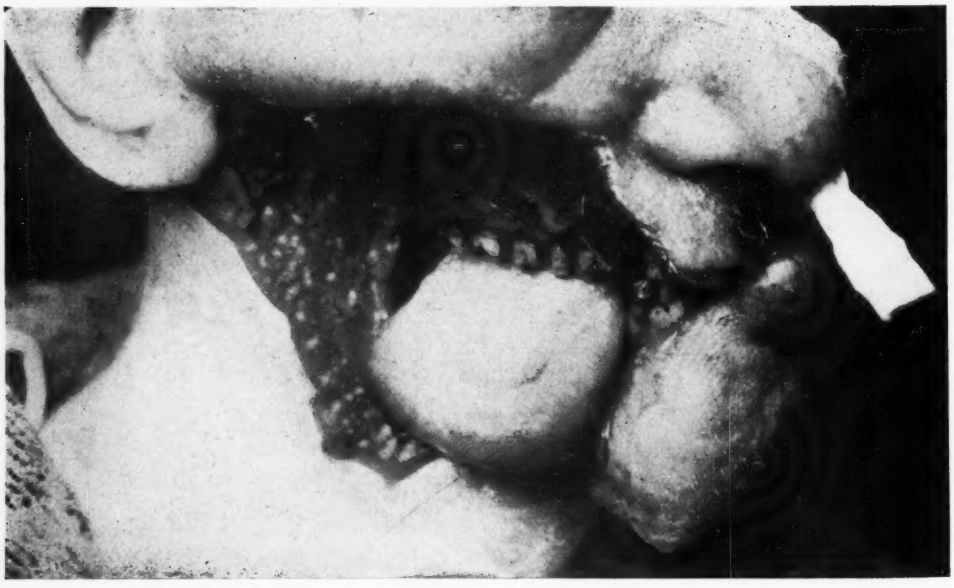


Fig. 16.—Case 11.

CASE 9.—Male, fifty-six year old, white. The patient noticed a mass in the posterior triangle of the neck on the left side and a mass in the tonsillar region two months before admission into the hospital. It grew very rapidly.

Examination showed the left anterior pillar and tonsil to be involved in an ulcer 2 x 2 cm., extending down to the alveolar ridge and completely destroying the tonsil. The mass was hard and not especially tender. There was a mass behind the ramus of the left jaw,

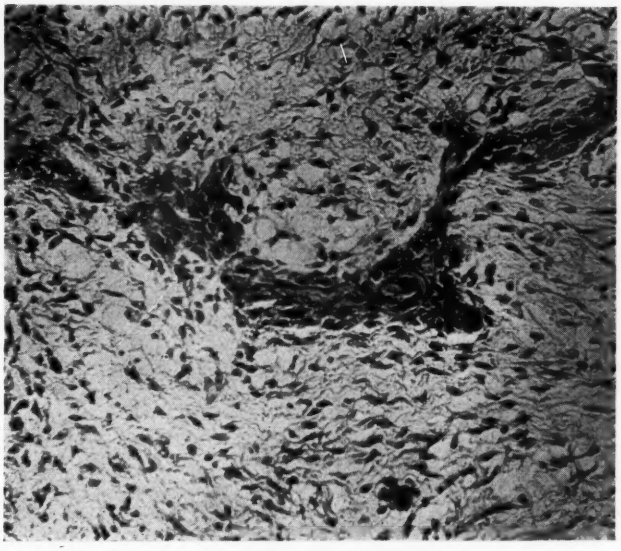


Fig. 17.—Case 11.

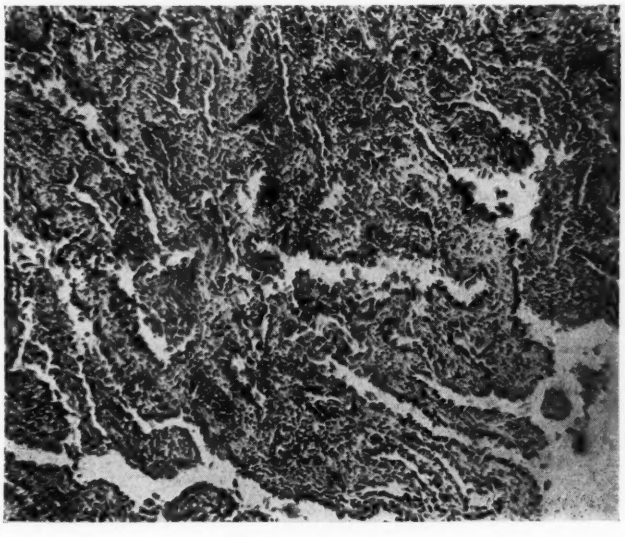


Fig. 18.—Case 12.

apparently continuous with the mass in the pharynx. An enlarged lymph gland was felt at the angle of the left mandible.

A complete lower neck dissection was done on both sides followed by removal of the tongue, the floor of the mouth and the upper lymphatics at a later date. The patient died eight years later of lobar pneumonia, without further evidence of carcinoma.

Pathology.—Fig. 14. This section has been taken through one of the regional lymph glands, the normal architecture of which has been greatly distorted. In spite of the fact

that no epithelial pearls were seen and no prickling, the flattening out of the cells and hyalinization has given it a Grade II.

CASE 10.—Male, fifty-five years old, white. The patient noted a small papule on the tongue two years before admission. He consulted a physician who gave him radium treatment. Later, a mass appeared in the neck.

Examination showed an ulcer 2½ x 1½ cm. in diameter with hard, raised edges occupying the position of the vallate papillae and going backward for attachment to the posterior

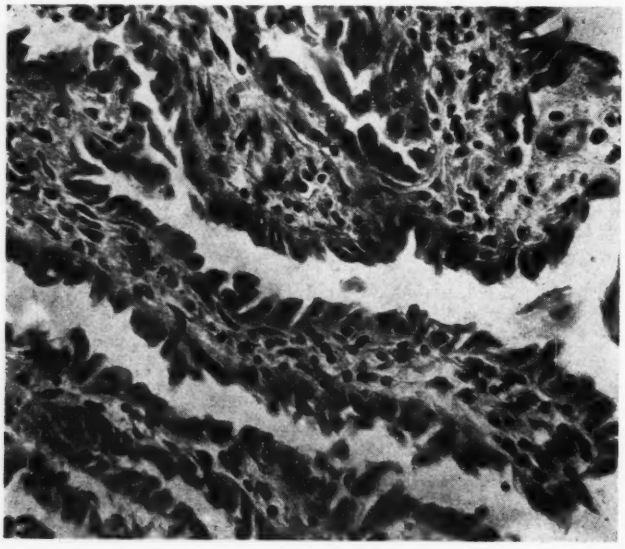


Fig. 19.—Case 12.

Fig. 20.—The section shows epithelial proliferation in a fairly dense fibrous area. Pearl formation is present and cell differentiation is complete enough to group this tumor as a Grade I.

faucial pillar of the right side. There was one large lymph node at the bifurcation of the carotid on the right side.

A preliminary tracheotomy was done followed two weeks later by complete excision of the tongue with an upper neck dissection on both sides. Later, a lower right neck dissection was done. Several weeks after this, a lower left neck dissection was performed. Fig. 15-*A* and *B*, taken three years after the operation, show the neck following the block dissec-

tions. Both internal jugulars and sternomastoid muscles are absent. The patient has a fair voice and is making his own way. The carcinoma was of low Grade I malignancy.

CASE 11.—Male, forty-eight years old, white. About two years before admission to the hospital, the patient noted a small ulcer on the mucous membrane of the right cheek in the molar region. He used caustics locally without improvement and later consulted a physician. He was given two radium applications followed by a local excision of the ulcer two months later. There was a recurrence which was removed with the actual cautery. Following this he had four x-ray treatments.

Upon admission to the hospital, a hard ulcer was found in the right cheek opposite the molar region with induration extending down to the mandible. The ulcer crater was 2 cm. in diameter. The cheek was swollen and reddened.

This patient had extreme pain before entrance to this service. He had been keeping cocaine in his mouth on the areas, had required a good deal of morphine, and had taken large amounts of whiskey to try to get relief. Operation in this instance was decided upon for the added reason of getting rid of pain.

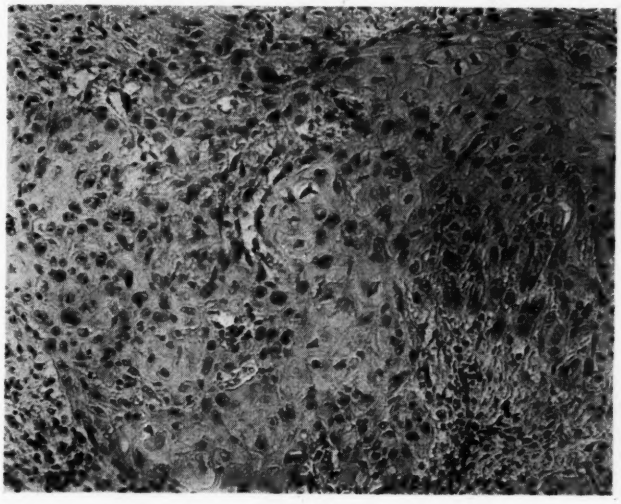


Fig. 21.—The cells are flattened and show a fair amount of hyalinization. However, there is considerable variation in the size and shape of the cells. Some mitoses are present. This carcinoma has been given a Grade II. It probably should be more properly considered in a grade between Grades I and II.

A cautery excision of the growth with removal of most of the right mandible and part of the maxilla, and an upper right neck dissection was done. Two weeks later, radium was applied to the wound edges and neck. At the time of discharge from the hospital, pulmonary metastases were noted. The patient died two months later. The metastases were probably present, though unrecognized, at the time of operation. In spite of the wide destruction and the outcome, the patient and his family welcomed the relief from pain the operation gave. (Fig. 16.)

Pathology.—Fig. 17. Tissue removed from around the ulcer edge showed no carcinoma, but merely dense fibrous tissue. The section shown here was taken from a hard sclerotic area around the mandible. The stroma is dense and abundant, presumably the result of radiation. The cancer cells show a moderate degree of differentiation. In other areas not shown here there is considerable hyalinization. The regional lymph glands in this case showed no evidence of carcinomatous invasion. It is interesting to note that cancer cells were found beneath the mylohyoid muscle. Whether or not radiation has influenced the differentiation of the cancer cells is a conjecture, as we do not know the picture of the primary growth.

CASE 12.—Male, fifty-six years old, white. Three weeks before the patient was admitted to the hospital, he noticed a small lump in the cheek.

Examination showed on the inner side of the right cheek a granular ulcerated tumor about 2.5 cm. in diameter, poorly defined and very hard. A few hard glands were felt just above the right clavicle.

A wide excision of this mass, including removal of the full thickness of the cheek, was done with the actual cautery and several months later a neck dissection on the right side was performed. Following this he had a repair of the cheek. He is now well, twelve years after the first operation.

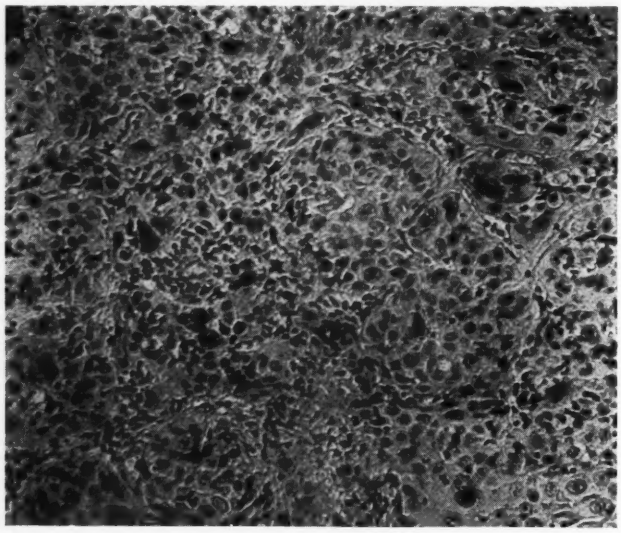


Fig. 22.—There is very little keratinization. There is a marked variation in the size and shape of the cells. Mitoses are easily demonstrated and giant-cell formation may be seen. There is very little fibrosis present. The poor differentiation has placed this carcinoma in Grade III.

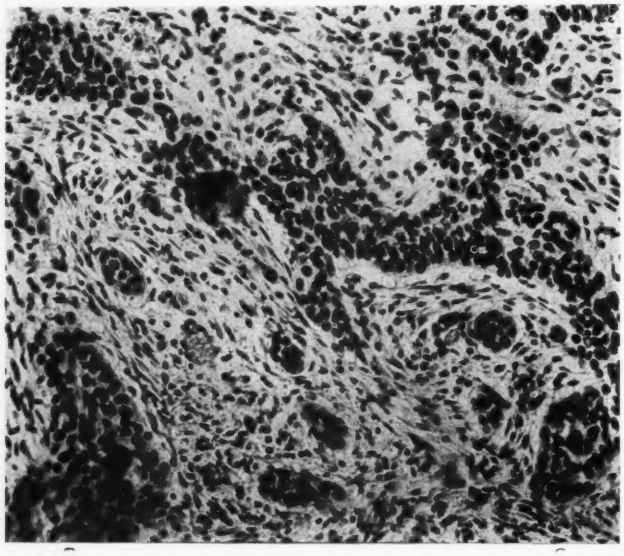


Fig. 23.—From the structure of the above section, it is difficult to say that this is a squamous cancer. Cell outline is indistinct and the nuclei are hyperchromatic. There is considerable variation in the size and shape of the nuclei. Mitoses are abundant. Many small lymph channels may be seen studded with the cancer cells. This tumor has been given a Grade IV.

Pathology.—Figs. 18 and 19. This is apparently a true adenocarcinoma, papillary in type, and is the only one in this series arising in the buccal mucosa. Fig. 19 is a higher magnification of an area shown in Fig. 18. One sees villi containing a delicate fibrous tissue stroma and lined by well differentiated, low columnar epithelium. There were no demonstrable metastases to the regional lymph nodes.

SUMMARY

1. Cases are grouped into fairly definite anatomic sites chiefly because of their relation to treatment and prognosis, and to facilitate classification, history-taking and presentation.

2. The term "carcinoma of the jaw" is not used because bone involvement is secondary and only incidentally influences treatment.

3. Growths with wide extension or metastases are put in the group corresponding to the primary growth site. Neck tumors do occur in which no primary growth site can be determined, but the majority of them are metastatic from some unrecognized upper respiratory or digestive tract growth.

4. Four arbitrary clinical stages are distinguished and are of practical use in giving a basis for treatment and prognosis from clinical findings.

5. Biopsies are done in most cases before treatment is begun, both for confirmation of diagnosis and for studying the relative degree of malignancy of the growth.

6. In arriving at a plan of treatment and prognosis, clinical and microscopic findings are considered together. No one criterion has been found to offer a basis of prognosis accurate enough to present a percentage plan to the patient of his chances of life.

7. Growths may for a time be held in relative abeyance, but later take on much more rapid growth if not a real increase in malignancy. In this series there is a higher percentage of undifferentiated growths in the late than in the early stages.

8. There has been observed a type of growth that in clinical aspects is cancer, but in which the microscopic picture does not show the typical definition of cancer. These growths may cause great destruction if not treated at least locally as cancer.

9. The degree of malignancy of metastatic gland carcinoma followed fairly closely that of the primary growth. There may be no microscopic evidence of malignancy in the regional glands, but this does not necessarily mean that the glands are not affected.

10. Though results are, of course, best in the cases where no carcinoma was found in the glands, there are cases in the series that show that undifferentiated carcinoma even in the glands of the neck is not an absolutely hopeless situation.

11. There is a high operative mortality, 21.5 per cent; all but one of the deaths occurred in advanced cases where very radical operations had been done.

12. The farther back in the mouth and pharynx the operation is carried, the higher the mortality. This is probably due to increased liability to respiratory infection.

13. Results of treatment are tabulated.

DISCUSSION

Dr. Robert B. Greenough, Boston, Mass., said that there was no question in his mind that the work Doctor Blair has been doing in the plastic repair of very extensive excisions in cancer of the mouth has opened up a field of useful surgical treatment in a group of patients

that have been left very much without help in the past. He was thoroughly in accord with the statement that if we can only rid a man of a sloughing, offensive local lesion within the mouth for as much as a year's time, even if after that he dies of more remote metastasis, we have accomplished a great deal for that particular man's good.

These extensive operations can only be done by making use of the principles of plastic surgery.

As to the grading of the degree of malignancy of the tumors in the decision as to just what is to be done in the individual case, he had been very confident that as time went on this principle would be more widely accepted. There is no doubt that what can be done in a tumor case of low grade malignancy may be bad judgment in one of higher grade.

The two following tables show the results of operation in a series of cases of cancer of the lip and cancer of the buccal mucosa which were graded into three and four groups of malignancy according to the amount of differentiation of the cells. The tables explain themselves.

TABLE I

CANCER OF THE LIP; RESULTS OF OPERATION; PATHOLOGIC GROUPING

	LIVING CASES	PER CENT	DEAD CASES
Group I	53	81.5	12
Group II	14	70.0	6
Group III	4	22.0	14

Simmons and Daland (Surg., Gynec. and Obst. 35: 766, 1922).

TABLE II

RESULTS OF OPERATION; PATHOLOGIC GROUPING

	CASES	CURES	PER CENT
Group I	17	12	68
Group II	14	3	21
Group III	17	1	6
Group IV	11	0	0

Simmons (Surg., Gynec. and Obst. 43: 377, 1926).

These cases were observed at the Massachusetts General Hospital and the Collis P. Huntington Memorial Hospital. The living cases were alive without evidence of disease three or more years after operation.

Doctor Blair had sent on to Boston a few sample slides from this series of cases that he has reported. Three different observers, Dr. Channing C. Simmons, Dr. H. F. Hartwell, surgical pathologist at the Massachusetts General Hospital, and the speaker had reviewed these independently. As a result of the examination of these fourteen specimens of different grades of malignancy, following the Broders classification of four grades, in only two instances did the estimates fall more than one grade apart. In other words, they were practically all agreed upon the cases of high malignancy, and of low malignancy; and only in the middle groups were there differences of opinion as between Grade I and Grade II, and these differences were virtually insignificant.

This would seem to demonstrate that in general the method of applying this gradation principle to cancer cases was being done in a reasonably uniform manner. There will always be some differences of opinion, since the personal equation enters so largely in the estimat.

In one respect their principles in Boston had been a little different from those suggested originally by Doctor Broders. In classifying the squamous cell tumors of the skin and mouth he attempted to estimate the percentage value of differentiation in the whole tumor. Supposing there was three-quarters of the tumor that was well differentiated, and one-quarter of the mass that was less differentiated, Doctor Broders would grade the tumor at a lower degree of malignancy than in one where those percentages were reversed.

With us, we have taken the position that the most malignant bit of tumor tissue that could be observed in the whole tumor was the one which was to be considered, so far as the

prognosis was concerned, and therefore, in a tumor which was generally of a low malignancy if areas were found that were distinctly of a high grade, the case is classed as one of high malignancy.

Dr. Channing C. Simmons, Boston, Mass., remarked that it is much easier to grade squamous cell carcinoma pathologically than the edematous forms, such as cancer of the rectum or of the breast, although this has been easier to grade squamous cell carcinoma pathologically than the edematous cancer. The clinical application of this is not yet entirely clear. It certainly is of great value in the prognosis of cancer of the buccal mucosa and lip, and has a distinct relation to the form of treatment which should be employed. For example, an extremely radical operation in this form of cancer is unnecessary if the tumor is of low-grade malignancy and small, while it should be done in every instance if the tumor proves to be of high-grade malignancy.

The term "cancer" applied to all the metastasizing epithelial tumors is in some ways unfortunate—cancer should be considered as a regional disease. There is nothing in common between cancer of the skin and cancer of the tongue and cervix. A tumor that would be of low-grade malignancy in cancer of the tongue, Grade I, is comparable to Grade III malignancy of the lip.

POSTOPERATIVE ROENTGENOGRAMS*

By Daniel F. Lynch, D.D.S., Washington, D. C.

THERE have been, in the past quarter of a century, many important developments in dental practice which have exerted definitely beneficial influences on our methods of procedure, but none has left a more profound impression upon so many phases of dental practice as has the roentgenographic process.

At first, emphasis was laid only upon the values of the x-ray negative as a preoperative adjunct in helping to arrive at a correct diagnosis. However, during the past five or six years its employment as a routine postoperative procedure has become increasingly popular with the dental profession. Much good has resulted from the close study given the postoperative roentgenogram in all departments of dental surgery. As a result, systems of procedure have been changed or improved, and surgical technics have been materially standardized.

The roentgenographic process has unquestionably altered our viewpoint with regard to various dental problems. For instance, in root canal therapy it enables the careful operator to obtain positive evidence as to the success or failure of his efforts, thus removing any doubt as to one of the most difficult and important dental operations.

The questions of the length of time required for the regeneration of bone, and to what extent it regenerates in certain patients and in certain areas, can only be determined by comparison of the immediate postoperative roentgenogram with the follow-up roentgenograms taken at intervals of six months, one year, two years, and so forth. Data, thus obtained, benefit the dentists who are interested in crown and bridge work, since the success of that type of work is largely dependent on process reduction and regeneration.

Roentgenograms made at intervals following the setting of bridgework, especially of the fixed type, reveal the strain that the abutments are undergoing and give the operator an opportunity to correct the occlusion by grinding. Radiolucent areas, extending the full length of the root, demonstrate the direction of the stress on the abutment.

In the specialty of periodontia the aid of the roentgenogram in determining the nature of the supporting structures of the teeth is an important factor of success in this newest phase of dental practice. The postoperative roentgenogram plays a part in the result of treatment of peridontoclasia, since it enables the operator to compare the depths of sockets before and after treatment.

In prosthodontia it has had a beneficial influence by enabling the operator to be sure that the roots of teeth have been completely removed and will not interfere with his efforts at restoration. Eusterman and Cook have shown in two separate series of unselected edentulous cases that about 30 per cent had

*Read before the Capital Clinic Club, Washington, D. C., May 6, 1929.

one or more roots present. With the routine use of the postoperative roentgenogram this percentage should be materially reduced if not, in fact, eliminated.

Today, many men in the field of operative dentistry do not consider their alloy fillings or their inlay restorations completed until they check them with a roentgenogram. The x-ray film will often reveal a poor gingival contact that an explorer cannot find. And also overhanging fillings are easily demonstrated in the roentgenogram. Secondary caries under restorations are often discovered by the periodic postoperative roentgenogram before this destructive disease has had a chance to endanger the life of the pulp.

Traumatic occlusion and lack of occlusion are sometimes shown in the roentgenogram. This fact is made use of by the orthodontist. By a close

A *B* *C*

Fig. 1.—*A*, showing third molar with curved roots: *B*, showing tooth removed with root tip in position; *C*, showing complete removal of all the tooth.

Fig. 2. Fig. 3.

Fig. 2.—Showing small particle of amalgam filling in socket.

Fig. 3.—Showing tooth completely removed but the presence of other roots in another area. These roots did not show on clinical examination.

study of the roentgenographic films, taken at stated intervals while a case is under his treatment, the orthodontist is able to prevent undesirable effects, while at the same time he has an authentic record of the progress of his case.

Although the routine use of the postoperative roentgenogram is steadily gaining favor in all fields of dental science, yet it will always remain of prime importance to the exodontist and the oral surgeon. Because of the nature of their work it is necessary that they watch and study each case for some little time after the operation has been performed. Not only does the postoperative roentgenogram demonstrate the success or failure of removing teeth in their entirety, but it also allows the operator to visualize the extent of the destruction of the process, and of the damage to the remaining teeth. Too often teeth

are extracted at the expense of those that are to be left. The exodontist is as good as the results he obtains, and without the use of the postoperative roentgenogram he is not in a position to compare the results of different technics with his own.

Browning states that the alleviation of pain for suffering humanity is one of our paramount duties, and therein lies our rôle as one of man's greatest benefactors. Any postoperative treatment that will minimize pain is worthy

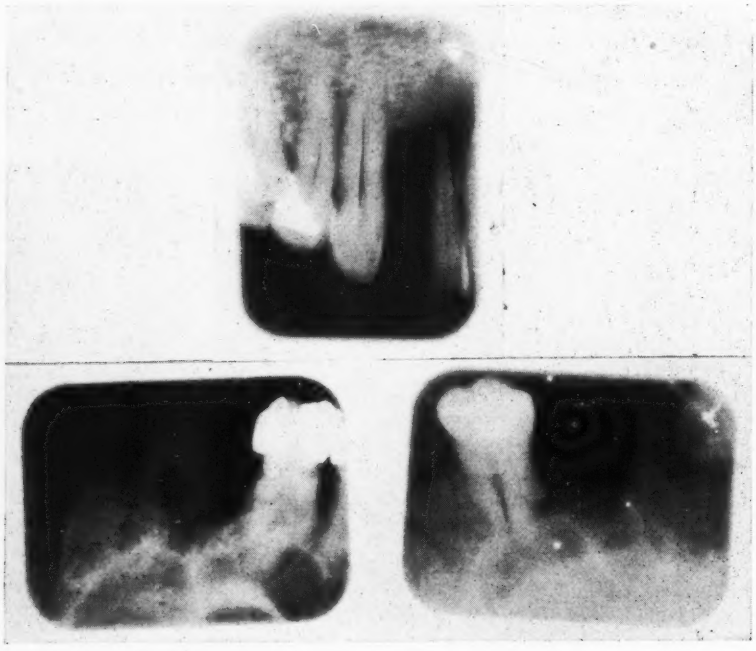


Fig. 4.—Showing the extreme periodontal destruction around remaining teeth that otherwise would be overlooked.

Fig. 5.—Showing an amalgam filling that has fallen into the socket from the adjacent tooth.

of our utmost consideration; for, after all, the success of the operation in the eyes of the patient depends just as much on the lack of pain after the operation as during the operation itself.

How many times have we been surprised to find a patient returning to our office and complaining of pain ten days after he had been dismissed for what had been a very simple extraction! Yet, on close examination of the wound, we find that a fragment of the buccal plate or spicule of intraradicular septum is loose and irritating the tissues. Removal of the irritant allows

the socket to heal readily. Although the postoperative roentgenogram will not always reveal these loose spicules, it does so in such a large percentage of cases that the exceptions are rare.

Once in a while we hear a dentist say that he always knows when he has removed all the tooth. To him postoperative roentgenograms are unnecessary and only an added expense to the patient. Yet I fear his confidence in his ability may be explained by his lack of experience in surgery rather than by his desire to boast. Operators are often satisfied when three roots of a maxillary molar or two roots of a mandibular molar are removed. However, when the postoperative roentgenogram is employed as a matter of routine, it reveals a large number of anomalies. This check-up permits the operator promptly to remove the extra roots and to avoid ensuing difficulties. Not only does this roentgenogram reveal the presence of a remaining root, but often it makes removal possible by a minimal loss of process and of trauma.

When a tooth contains a large amalgam restoration, it is almost sure to break if a straight forceps technic is used in its removal. When this happens, who is the surgeon who is so sure that none of the metallic material has fallen into the socket? Still, a postoperative roentgenogram taken immediately will remove all doubt; and if part of the amalgam is in the socket, it can be removed while the patient is still under the influence of the local anesthetic.

It is true that roots may be superimposed, and what may appear to be one root in the preoperative roentgenogram may prove to be two roots if a postoperative roentgenogram is taken after the removal of the supposedly single root. This is especially true in the maxillary first premolar region and in the mandibular molar region.

And furthermore, the legal value of the postoperative roentgenogram cannot be too strongly emphasized. It is not only a definite record for the dentist to keep in his files, but it is also convincing evidence that he has made every effort to check his work. Patients realize this fact, and as a result they prove to be more cooperative during the postoperative treatment period and when dismissed are satisfied that their mouths are free of residual infection.

I fully agree with Gardner when he says: "From the standpoint of postoperative service, the roentgenogram made directly after operation is outstanding in its importance. If it shows that all roots have been removed, the patient will be more tolerant of any discomfort that may follow." He further says that he has used this procedure as a routine for many years and feels that he has proved its importance. A roentgenogram that reveals that the leg or arm is properly set, or that the extraction of a tooth is satisfactory, is a comfort to the patient, the physician, and the dentist.

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DEPARTMENT OF
DENTAL AND ORAL RADIOGRAPHY

Edited By
Clarence O. Simpson, M.D., D.D.S., F.A.C.D.,
and Howard R. Raper, D.D.S., F.A.C.D.

THE DETERIORATION OF RADIODONTIC FILMS

By Dr. Clarence O. Simpson, St. Louis, Mo.

THE preservation of radiographic films is a duty and an instructive feature of radiodontic practice. The evidence recorded by radiodontic examinations is a protection to conscientious dentists who might be accused of malpractice or held responsible for conditions beyond their control or for operations which they did not perform. When advice and treatment are founded upon radiographic evidence, it should be retained as an essential part of the case records. Since there is a variance of opinion regarding the interpretation of radiographs and the significance of dental conditions, the records should be available for inspection when discussions or disagreements arise. This particularly applies to patients referred for examination and upon whom reports are made.

In beginning a radiodontic examination there are great advantages in having the films of previous examinations as a guide, especially when a notation has been kept of the projection angles. Technical errors can be avoided, the favorable views can be chosen, and the anatomic peculiarities of the patient can be predetermined. The saving of time and labor is a strong appeal to follow this system when former records are accessible.

Interpretation is always more reliable and often depends upon a comparison of the radiographs with those made at previous times. Attention may be attracted to slight but significant changes which otherwise would be overlooked. Anatomic and physiologic variations may simulate pathologic processes and be misinterpreted, unless the evidence is compared with that of former examinations. The results of treatment can be observed as a basis for judgment in future decisions. The prognosis of different types of treatment may be determined by study of the changes which have occurred and the developments during an extended period of observation.

Proficiency in any art is gained by intensive application to the technical details and constant effort to correct mistakes. Incentive for progress and gratification from achievement are obtained by contrasting the results at dif-

ferent periods. In radiodontic practice, the records of each case should be studied critically for possibilities of technical improvement, and a comparison made with previous examinations of the same patient to observe the evolution in skill. Impressions of one's proficiency may be deceptive in the absence of material proof.

Perception is developed by diligent study of radiographic evidence. By repeatedly inspecting the files of unusual cases and classifying them, a keener vision will be acquired for the judgment of interpretation problems. Perplexing findings are clarified by comparing them with others which are similar. These are some of the advantages of preserving radiodontic films for reference.

An exasperating feature of radiodontic practice in the central Mississippi valley is the deterioration of the films. This may occur at any time after four years, but the probability of the action and proportion of films affected increases with their age. The inconstant results render it difficult to determine the cause of the destructive action. Some films fifteen years old are in perfect condition, while others only seven years old are a fused mass of gelatin and celluloid. Of the films in the same envelope, some are unchanged, while others are stained, faded or fused. Some films on open mounts in one office have deteriorated, while the duplicates in filing envelopes in another office are preserved, and in other instances the conditions are reversed. There is no apparent relation between the use of standard or special developer, hardening solution, or chemical reducer. The films were handled carefully and not finger marked or contaminated.

The proportion of the films affected by the change after eight years is approximately one-third, which is sufficient to impair the integrity of the records. The first sign of deterioration is a yellow stain with a metallic luster on the emulsion. This discoloration usually corresponds to the outlines of another film which was in contact with the emulsion. Later, the images disappear and the films adhere to each other from the formation of a substance like glue in appearance and odor. The envelopes are stained and disintegrated by the chemical action. Films tightly filed, either covered by celluloid on mounts or bunched in an envelope usually degenerate more rapidly than others, while those lying unconfined in a drawer are the least susceptible. There is no evident difference in the effect of manilla and white envelopes. The preservation of films is not influenced by metal or wood filing cabinets, as the results average about the same whether they are canned or aged in the wood. The most constant factor in the change is the contact of other celluloid with the emulsion side of the film.

The metallic luster which first appears on the emulsion and the yellow stain would suggest hypo remaining in the emulsion. The fading of the image would indicate that the fixing was inadequate. However, special care was exercised in fixing and washing the films. With the motive of securing photographic excellence and permanency, reasonably fresh solutions were always used. The films were fixed for ten minutes by the clock when haste was required and usually twenty minutes, and they were washed in running water

for a minimum time of twenty minutes and generally much longer. The filing cabinets were never in direct sunlight or near a radiator and were exposed only to the office temperature of the seasons.

One film manufacturer stated that the action was due to heat and advised keeping the stored films at a temperature of 70 degrees. This method would necessitate storage below a comfortable room temperature in winter and refrigeration in summer. There is sufficient difficulty in maintaining developer at the proper temperature, without having to preserve films by a thermometer. Another manufacturer expressed the opinion that hypo retained in the emulsion was the cause of deterioration. If this is true, films must be washed more than thirty minutes in running water.

Chemical decomposition of the celluloid base or the emulsion of dental films is a probability to be investigated. This theory is supported by the deterioration not occurring in radiographic plates or in photographic plates and films of an equal age which were subjected to the same chemical processes and similar storage conditions. Suspecting a lack of ventilation from the odor of celluloid, one dentist drilled holes through the top and bottom of his filing cabinet three years ago, but it has not eliminated the trouble. A chemist thought that the change might be caused by evaporation of camphor from camphor. The new cellulose-base films may be an improvement in this respect, or perhaps they will prove to be worse.

Since nothing regarding this result had been seen in radiographic literature, and no mention of a similar experience had been heard elsewhere, the possibility of local conditions or individual methods being the cause was considered. To investigate these factors questionnaires were sent to veteran radiodontists in New York, Minnesota, Florida, Alabama, New Mexico, Colorado and Oregon. The data from incomplete returns indicate that deterioration of radiodontic films is more prevalent in warm climates, but occurs to some extent in all sections of the United States. The relative humidity does not appear to be a factor, since the report from Dr. Raper gives as his impression that films are not as well preserved in New Mexico as they were in Indiana. It is peculiar that intermittent, moderately high temperatures would affect the films when they are insulated from heat by the filing cabinet and paper envelopes.

The solution of this problem is an obligation of dental film manufacturers. After exactly conforming to their directions in chemical processes and employing all feasible precautions for protection, the destruction of radiodontic records within a few years cannot be accepted without protest. There are definite reasons for desiring permanency, and if the fault lies in defective materials, it should be corrected. The many films which apparently are not affected by age demonstrate that the celluloid base is not inherently responsible. If some celluloid is subject to chemical disintegration, the quality should be determined by tests before it is distributed. Doubtless moving picture films will deteriorate in a similar manner. Then the amateurs who believe that they have movies of their children, travel scenes, the antics of friends will be disappointed with cans of brittle celluloid or home-brewed glue.

The cynic would say that most amateur movies deserve a worse and earlier fate, and an eulogist might be no more complimentary to amateur radiographs.

Until a more effective remedy is found, it will be necessary to observe more rigid precautions in attempting to preserve radiodontic records. The fixing solution should be renewed more frequently, and the films should be fixed and washed longer than the instructions have specified. The films should not be covered with celluloid in mounts, and the filing envelopes should not be tightly packed in drawers. The filing cabinets should be located in the coolest place available. As an extreme precaution in retaining cherished records, prints or lantern slides should be made of them.

ABSTRACT OF
CURRENT LITERATURE

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA
DENTAL RADIOGRAPHY
By Dr. Edward Preble, New York City

NUTRITION AND PEDIATRICS
By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Orthodontia, Oral Surgery, Surgical Orthodontia, and Dental Radiography

Referred Pain. Editorial in the Dental Surgeon (British) December 28, 1929.

It often happens that pain due to dental disease is referred to the neighborhood of the ear of the same side and hence passes for earache. To explain the phenomenon it has usually sufficed to accuse the anatomic connection between the auriculotemporal nerve and the mandibular division of the fifth cranial nerve. In a recent number of the *Lancet,* Carew-Shaw advances a different explanation pointing out that this mandibular division before it emerges from the skull gives off a small branch known as the nervus spinosus which accompanies the parent trunk through the foramen ovale but then passes back into the skull through the foramen spinosum to supply the mastoid antrum, aditus and posterior portion of the middle ear. Carew-Shaw regards this nerve as the one to accuse in accounting for pain referred from the teeth to the ear. The editor of the *Dental Surgeon* does not accept this explanation because it does not explain the pain which originates in the maxillary teeth. Again referred pain in the ear may not proceed from the teeth at all but from disease in the floor of the mouth, posterior part of the tongue, maxillary antrum, etc. We do not know, however, why pain is so commonly absent in the very conditions in which it is oftenest seen. Naturally in these cases the ear must be thoroughly examined. In a case of supposed acute mastoiditis nothing was found on examination but a carious maxillary molar. All symptoms disappeared after extraction. Again when supraorbital neuralgia, due presumably to inflammation of the frontal sinus, was the diagnosis, the extraction of a mandibular molar with alveolar periostitis caused a disappearance of all symptoms. In general in these cases of supposed earache a dental radiogram should be taken.

Nutrition and Pediatrics

Malnutrition in School Children. Samuel I. Wadley. Memphis M. J. **6**: 1, 1929.

In a timely article Wadley reiterates some generally accepted views regarding the malnourished child. Although most malnourished children are underweight, there are many children who can be classed as undernourished if due consideration were given to such factors as their lack of luster of the hair and eyes, poor color and anemia, poor posture, a lowered tone of vigor, lack of endurance, lack of pep and an increased susceptibility to diseases.

A physical examination is the most successful way to determine whether there is malnutrition present, and the author feels that there is much need to impress the lay public with the desirability of having the child examined at stated intervals. The pre-school child particularly would be benefited by routine physical examinations.

The causes of malnutrition are enumerated under five headings:

1. Physical defects.
2. Wrong food and bad eating habits.
3. Wrong health habits.
4. Overfatigue.
5. Bad home influence and lack of discipline.

In addition to including the teaching of personal hygiene in the schools, Wadley favors the establishment of lunch rooms under competent scientific supervision. He also advocates open-air schools for the more seriously handicapped children.

Basal Metabolism in Children of Abnormal Body Weight. Anne Topper and Hannah Mulier. Am. J. Dis. Child. **38**: 2, 1929.

These investigators report of their careful study of the basal metabolism of 35 boys and 35 girls between five and fifteen years of age, all of whom were diagnosed as having chronic malnutrition, and whose weight ranged from 10 per cent to 33 per cent less than normal. The authors compare their results with their previous series of 70 children who were overweight. Basal metabolism tests on these two series disclosed the fact that the majority of children came within the normal limits.

Topper and Mulier observed that there was a tendency for an increased basal metabolism rate in overweight children and a tendency toward a decreased rate in the basal metabolism of the malnourished children. In regard to the latter class they noticed that when children were 25 per cent underweight the basal metabolic rate fell below the lowest limit of minus 10 per cent, while no such tendency occurred toward a plus basal metabolism in children who were overweight.

Incidentally these interesting studies of basal metabolism on girls and boys who were at the period of puberty, that is between the ages of twelve and fourteen years, confirmed the observations of other experts who found that a certain percentage of children (irrespective of whether the body weight

was above or below normal) had an increased basal metabolic rate. These authors feel that this is probably due to a temporary increase in function of the thyroid gland.

What Place Have Aluminum, Copper, Manganese, and Zinc in Normal Nutrition? Editorial in J. Nutrition **1**: 6, 1929.

More than 99.9 per cent of the total body weight is composed of an association of a dozen different chemical elements, namely, carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, chlorine, potassium, sodium, calcium, magnesium, and iron. Among the more important minerals comprising the fractional remainder are aluminum, copper, manganese and zinc. The rôles of these in nutrition are briefly discussed.

The increasing use of aluminum for cooking utensils from which small amounts may be dissolved by the food, has stimulated investigators as to its natural occurrence in foods and its influence on the animal organism. Significant amounts of aluminum have been found in the common foods. Animal experiments as yet have not been conclusive in their evidence to determine if minute amounts of aluminum are essential for growth. It is interesting to note, however, that analyses of human tissue from autopsy material disclosed aluminum in brain, heart, liver, gall bladder and bile, kidney and spleen. In passing it may be mentioned that although aluminum occurs in small amounts in food and in tissue, at the present time there is no clear-cut evidence that it has any specific function.

It has been known for a long time (since 1867) that copper is an essential constituent of the blood of many animals. Copper is found in the human body and is to be found in many of the foods, ranging from 44 mg. per kilogram of fresh calf's liver to 0.1 mg. per kilogram of fresh celery. Many experiments, particularly performed on rats, are suggestive that copper has an important function in the formation of hemoglobin and in the metabolism of animals having red blood. Thus far, on the whole, evidence indicates that copper, which is so widely distributed in the animal body and is so definitely a constituent of the liver, must be regarded as an element of importance in iron metabolism.

The evidence in regard to the rôle played by manganese is too meager to generalize. Some of the known facts regarding manganese are that it is present in most living tissue, both animal and vegetable. The largest amounts found in the body are present in the liver, pancreas, lymph nodes, and kidneys; in the blood it is present in fairly constant concentration.

Zinc is widely distributed in the human body, being present in practically the same amount as iron; 2.2 gm. for zinc as compared with 2.8 gm. for iron are the estimates for a man weighing 70 kilograms. In the human body the largest amounts of zinc are found in the bones and hair.

Hubbell and Mendell in 1927, after writing of their experiments with zinc on mice, conclude: "It is not unlikely, however, that there is some variation in growth with varying amounts of zinc and that the metal is not merely an accidental factor in the nutrition of the mouse."

The Rôle of the Various Vitamines in the Production of Anemia. Chester S. Keeper and C. S. Yang. National M. J. China **15**: 4, 1929.

These authors reporting from the Peking Union Medical College review the current opinions regarding the relationship of the different vitamines to blood formation and relate some of their own studies of the blood in patients having nutritional disorders caused by avitaminosis.

In regard to vitamine A and its relation to blood formation, these investigators feel that there is no conclusive evidence to show that the lack of this vitamine alone is a decided factor in the formation of blood. Although experiments on animals indicate that a lack of vitamine B leads to a decrease in the formation of blood, the investigators agree with the consensus of opinion of others that in the main vitamine B is not necessary for blood formation nor does its lack lead to anemia.

Keeper and Yang summarize their discussion on vitamine C by stating that a diet lacking in vitamine C is capable of producing experimental anemia. In man, however, scurvy may exist without anemia. In regard to the vitamine D deficiency, the authors hold that anemia is not a constant feature. These investigators state in their summary that vitamine deficiencies in adults sufficient to cause kerato, malacia, beriberi, scurvy, rickets, osteomalacia, and dysentery do not produce anemia. If anemia is present in these patients, they state that it must be due to a deficiency of some other substance, or to some other factor, for example, as infections.

Studies of the Effects of Overdosage of Vitamine D. Miller and Charles N. Frey. J. Biol. Chem. **84**: 1, 1929.

Because many investigators have reported that many massive overdoses of irradiated ergosterol produce anorexia, impairment of growth, and a decline in the general physical condition of white rats, these investigators studied the calcium, phosphorus and ash balances of animals fed varying dosages of irritated ergosterol for a short time. As a result of their observations on rats, they conclude in part that excessively large doses of irradiated ergosterol must be administered daily before any ill effects are noted. Moreover they also noted that excessive amounts of vitamine D caused a drainage of mineral constituents from the body. In this respect there was relatively greater elimination of phosphorus than of calcium.

Is Irradiated Farina as Bought in the Market Enriched With Vitamine D? Frederick W. Schultz and Mildred R. Ziegler. J. A. M. A. **93**: 19 (1929).

These authors purchased irradiated farina and untreated farina in the open market; the former was purchased in a box on which was printed a description of the addition of vitamine D to the farina by ultraviolet rays.

The irradiated farina was fed to a series of rachitic rats for ten or fifteen days to determine whether it is curative in rickets. Ten per cent was the amount selected, as the authors considered this amount would be comparable to that which the average child would receive daily in the ration.

From their data Schultz and Ziegler summarize their paper by stating that "irradiated farina as purchased in the open market and incorporated as 10 per cent of a rachitic diet does not cure rickets in rats."

Chronic Dyspepsia in Children of School Age. F. S. Langmead. Brit. M. J., October, 1929.

Langmead presents the familiar picture of a child who is ailing, dull, listless, lacking in vitality and composure, and with a poor appetite, coated tongue, heavy breath, muddy complexion and sunken eyes with dark orbital rings or puffy eyelids. The symptom complex in such a child spells "chronic dyspepsia." In addition, such a child may complain of indefinite abdominal pains. Not infrequently a child with chronic dyspepsia has disturbance of sleep and arises in the morning with a tired and drowsy feeling. Fevers may also be present. The child also presents varying physical symptoms, such as despondency and irritability and is subject to fits of anger and temper. The child with chronic dyspepsia always shows some impairment of nutrition and always has irregular stools, both in number and in their consistency.

In his discussion of the etiologic factors, Professor Langmead points out that food plays an important part. Diets containing too much roughage, such as unripe fruit or indigestible matter which is taken with cakes and sweets, such as nut-milk chocolates, all cause an irritation of the intestines and with this a mild colitis. The eating of a relative excess of fat or carbohydrate foods plays an important part in the causation of chronic dyspepsia. Sometimes gastrointestinal symptoms follow the partaking of some protein foods to which the child is sensitive. Infection of the tonsils or sinus or enlarged adenoids or dental caries are contributing factors in the causation of this condition. In regard to the frequency of the appendix as a source of infection and cause of intestinal dyspepsia the author states that this is a matter of opinion.

As to the rôle of the nervous system and its relation to chronic dyspepsia, Langmead is inclined to believe that the nervous symptoms are due partly to toxins, partly to less restful sleep and partly to the effects of exhaustion. In addition the author aptly states that "many of these children, however, were of the nervous type originally, though made worse by the dyspepsia and by the solicitude and petting of anxious parents."

Motility of the Empty Stomach in Normal and Malnourished Asthenic Children. Alice Rupp and Frederick W. Schultz. Proc. Soc. Exper. Biol. Med. **26**: 8, 1929.

In a preliminary report on their experiments with the motility of the empty stomachs of five normal and fourteen asthenic children, Rupp and Schultz observed that the activity in the asthenic children is less than in normals. Whether the lowered activity in the asthenics is peculiar to the type or is a part of their generally poor nutritional condition, or whether the low activity itself leads to malnutrition are, in the words of the investigators, "questions still to be answered."

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EDITORIALS

The Commercial Dental Laboratory

WE ARE cognizant of the fact that many changes were brought about by civilization which are of great advantage, but we are often reminded that factors of disadvantage also occur.

As a result of the changes brought about in the practice of dentistry, the commercial dental laboratory has made its appearance. For a number of years no one paid much attention to the dental laboratory. It was not seriously considered either an aid or a menace. However, due to changes brought about by the growth of the commercial laboratory, the question has come up as to whether the public and the dental profession would not be better off without it. This laboratory question has been forced upon the profession in several different ways, some of which we will consider briefly.

In several states the laboratory workers have made attempts to get legislation passed giving them a professional standing. This we believe would be detrimental to the dental profession. For years there have been attempts to raise the educational standards of the dental profession, and these attempts have not been futile. Any bill which would license the dental mechanic would tend to nullify the good which has been accomplished up to the present time. It seems foolish to raise the educational standard in one direction and have it lowered in another.

An effort has been made to have legislation enacted which would license dental laboratories. In fact the dental laboratories in New York state have succeeded in getting such a bill passed during the last session of the legislature. However, the bill was so poorly written that up to the present time it has not been possible to administer it. The dental profession in the State of New York has gone on record as being opposed to this bill. This opposition is based upon these facts: first, the bill is poorly worded; second, the bill makes no provision for dentists who conduct their own laboratories; and third, the bill would place the laboratories in the hands of a few individuals who would have absolute control and thus retard the growth and development of dentistry. Also, there is no need to license the commercial dental laboratory because it is not in direct contact with the public. The dental laboratories must distribute their work among the dental profession, and the dentist is the one who passes on the value of the work.

It is the belief of many, however, that the licensing of dental laboratories is only the first step toward their obtaining a second bill which would enable the dental mechanic to do work for the public. We refer to this when we say that such bills would nullify the long fought for educational standards of the dental profession.

Another fact which proves that the dental laboratory is not the godsend which a great many think it to be, is shown by the attempts that have been made to unionize the laboratory workers. At the present time a group of laboratory workers are on strike in New York City. This group is controlled by a professional organizer who is in no way affiliated with the American Federation of Labor, and in reality the whole thing is nothing but an ordinary racket. Laboratory workers who refuse to sign contracts have been threatened and even beaten up by the pickets for the new laboratory union. It has been suggested that the idea of this union is to organize other branches of the dental profession including the dental office, after the laboratory workers have been organized. This unionization would permit an undesirable element to dominate all branches of the dental profession.

It is an economic fact that professions cannot be organized along the same lines as trades. There was an attempt made a few years ago to call a strike of laboratory workers in Chicago. We believe that resolutions were passed by the Chicago Dental Society at that time condemning such procedure. Indiana also passed similar resolutions. At a joint meeting of the First and Second District Dental Societies of New York the following resolutions were passed relative to the strike in New York at the present time:

"WHEREAS, It has come to public notice through the medium of the daily press that there is in effect a strike of the dental laboratory employees; and

"WHEREAS, It has been reported that acts of coercion, intimidation and violence have been resorted to; and

"WHEREAS, The so-called commercial dental laboratory has become a relatively large industry and one upon which many members of the dental profession are dependent for prosthetic service; and

"WHEREAS, The quality of this service has a direct bearing upon the health and well-being of the public; and

"WHEREAS, The conditions under which prosthetic work is produced should be such as to stimulate and encourage the best efforts of the producers; and

"WHEREAS, Such conditions presuppose a fair wage, reasonable working hours, clean and decent surroundings for the employees, a fair profit for the employers, a friendly and cooperative spirit between employees and employers; and

"WHEREAS, The dental profession is directly responsible to the public for the product of the laboratory, and since it in turn must place responsibility upon the laboratory head or owner; therefore, be it

"*Resolved* by the First and Second District Dental Societies, in regular meeting assembled, that any movement that may tend to discourage or hamper the advancement of dental prosthesis, which shall discourage the development of the skill of individuals or groups employed in the laboratory industry or which shall tend to interfere with or hamper the conscientious laboratory employer in his endeavor to render the highest type of service to the public and the dental profession; and be it further

"*Resolved:* That the First and Second District Dental Societies of the State of New York, profoundly cognizant of their public duty, encourage all lawful efforts intended to improve the quality of the product of prosthetic dentistry and to promote better relations between the good laboratories and their employees, but unequivocally condemn any individual or group movement which shall tend by whatever means to impose unessential conditions or restrictions which shall interfere with the orderly and natural development of dental prosthesis or the improvement of service as rendered by the dental laboratory."

Erratum

In the article entitled "An Appreciation of Milo Hellman's Work" by William K. Gregory, published in this Journal, Vol. XV, No. 11, November, 1929, the concluding paragraph should be deleted, as it was not written by Professor Gregory and was included in his article by an error. The original article concluded with the paragraph preceding the last, as follows:

"May he live to see the successful drawing together of all his researches on the evolution, growth and differentiation of occlusion and on the classification, diagnosis and treatment of malocclusion into one great textbook of orthodontia."

Book Reviews

The Practice of Periodontia*

THE PRACTICE OF PERIODONTIA is intended as a textbook for practitioners and students. The book is written in a very concise manner and presents the subject practically.

Chapter I gives a brief review of the histology of the parts involved in periodontal lesions. Chapter II deals with the physiology of the parts involved.

Considerable stress is given to examination of patients, and a very complete record chart is enclosed and described.

Chapter V contains a series of radiographs showing different types of conditions.

The subject of traumatic occlusion is treated to considerable length including the use of an articulator for the mounting of casts.

Under the subject of instrumentation are shown different types of instruments and their uses. The method of brushing the teeth is also considered as a part of periodontal treatment.

The book as a whole is very well written and should form the basis for treatment of every periodontal condition.

Exodontia†

EXODONTIA is the title of a small book by Dr. C. Dudley Gwinn.

Chapter I gives a brief outline of the history of extraction. Under Chapter II various instruments used for extraction are considered. Considerable stress is laid upon examination of patients before extracting. Fewer accidents would occur if more dentists would follow the advice outlined in this book. Chapter IV is devoted to surgical shock, its causes, prevention, and treatment.

The writer very closely follows the ideas advanced by Dr. Crile as to causes and treatment of shock.

The illustrations in Chapter V showing character of bone of the mandible and the maxilla are made from actual specimens and therefore have an advantage over some drawings appearing in earlier textbooks.

The nomenclature of the book is rather ancient because the author still adheres to "lower and upper teeth" and also uses the questionable terms of "cuspids and bicuspids." We hope that in the near future dentistry will have progressed to the adoption of a scientific nomenclature instead of the incorrect terms which have been employed so long.

Besides normal extractions the book contains a chapter on "Indications and Technic for the Removal of the Buccal and Labial Plates of the Alveolar Process" and a chapter on surgical treatment of the alveolar ridge.

The book as a whole is well written and should form a very valuable addition to the library of a general practitioner.

*The Practice of Periodontia, by Sidney Sorrin, D.D.S., and Samuel Charles Miller, D.D.S., published by The Macmillan Company, New York, N. Y.

†Exodontia, by C. Dudley Gwinn, D.D.S., published by Lea & Febiger, Philadelphia, Pa.

Dental Infection and Systemic Disease*

DENTAL INFECTION AND SYSTEMIC DISEASE is a book by Dr. Russell L. Haden, M.A., M.D. Dr. Haden has long been known as an authority on infections. The book contains a Foreword by Dr. Edward S. Rosenow.

A number of case histories are given and also results of animal inoculations from germs obtained during the treatment of dental infections. Some of the cases are quite interesting, while others are inclined to show rather negative results. The following statement from the book does show a rather uncertain state of affairs:

"Dental infection from which bacteria highly virulent for animals may be recovered is found in a large proportion of adults. Often the clinical and experimental proof is convincing that a patient's lesion is due to infected teeth. On the other hand, dental infection occurs with great frequency in comparison with the incidence of proved systemic disease of focal origin. Many individuals doubtless carry infected teeth throughout life without showing manifest disease of focal origin, although marked injury to vital organs may result from the long-continued absorption of bacterial poisons without being recognized. Myocardial disease which is responsible for such a high proportion of deaths after middle life is an excellent example. The relation of focal infection to such a disorder is often lost sight of. Not infrequently diseases due to other conditions have been incorrectly attributed to focal infection."

After reading the book one would probably have the same opinion regarding dental infection as one had before. However, the book is entitled to a place in the library of every general practitioner.

*Dental Infection and Systemic Disease, by Russell L. Haden, M.A., M.D., published by Lea & Febiger, Philadelphia, Pa.

NEWS AND NOTES

American Society of Orthodontists Meeting in Nashville

The American Society of Orthodontists will hold its twenty-ninth annual meeting at the Noel Hotel, Nashville, Tennessee, April 8, 9, 10 and 11, 1930. An attractive program is being secured, and this meeting should be one of extreme interest to every member of the Society.

A cordial invitation is extended to all ethical dentists who are interested in orthodontia. There will be a registration fee of $10 for non-members.

Oren A. Oliver, president,
Nashville, Tennessee.
Charles R. Baker, secretary-treasurer,
636 Church Street,
Evanston, Illinois.

Nashville Offers Many Beauty Spots and Points of Interest—Scenic Trips Plentiful

Nashville, Tennessee, and its surrounding territory will be found to abound in points of interest and side trips. Members of the American Society of Orthodontists attending the annual convention in Nashville on April 8, 9, 10 and 11 will find no idle time on their hands in the home city of President Oren A. Oliver.

Nashville itself is a city filled with an atmosphere which is seldom found in any city. Its points of interest are unique and outstanding, and the entire country is filled with beauty spots and points that every one wishes to see. These have caused middle Tennessee to be known as "The Dimple of the Universe," and just as a dimple on the chin of a beautiful woman sets off and enhances her beauty, so these places set off and add to Nashville's charm.

Where could one find such a sacred and peaceful spot as the Hermitage? Here is a shrine of Americanism to which thousands go each year to see the spot made famous by that glorious American, Andrew Jackson, who rose from an obscure mountain lad to the presidency of the United States at a time when this nation was in its building. He was either elected to, or appointed to, more offices than any other American and resigned more than any other citizen ever held. He won fame for himself and his proud Volunteers by stopping the Indian uprisings in the South and followed this by saving the nation at New Orleans. He practiced law when his time was not taken up with the duties of a public citizen or when he was not watching his famous horses run or not entertaining distinguished Americans and visitors at his magnificent country home, the Hermitage. He has a record for public life embracing the positions of public prosecutor (attorney general) in 1790; member of the first Constitutional Convention of Tennessee in 1796; first representative in Congress from Tennessee in 1796; twice served as United States senator from Tennessee, 1797 and 1823; judge of the Superior Court of Law and Equity, 1798; general, Tennessee Militia, 1802; conquered the Creeks in 1813-1814; became major general of the United States Army in 1814; won the Battle of New Orleans, January 8, 1815; served as governor of Florida in 1821; elected president of the United States, 1828 and 1832. He was the only president, except Washington, who appointed during his administration the entire Supreme Court of the United States and was the only president who paid the entire national debt.

It was to the Hermitage that he returned from his many offices and public labors; there amid the serene and peaceful surroundings he loved and gave his tender devotions to

his beloved Rachael. It was to the Hermitage that he gathered distinguished men, public officials, foreign diplomats and others, to entertain them with true southern hospitality. It was here that he returned wounded after his duel with Dickinson, to be with the wife for whom he had fought on the field of honor to protect. No wonder Jackson loved his Hermitage and spent his remaining days there, and now he sleeps beneath the beautiful and stately magnolia trees in the garden that still remains flowered with the same old shrubs and plants that he loved.

In the Hermitage itself are to be found relics such as no other president ever compiled and saved by future generations. His swords, his writings, his pistols, his gifts from famous men of the world, and countless other trinkets, rare and interesting, are in the building. The Hermitage is something that one never tires of seeing, and each time it offers a new charm and fascination: the old furniture of his day, the old canopied bed, the old stage-coach in which he made his trips to and from Washington; the old servants' quarters where old Uncle Alfred and other servants of note lived; the old spring house and the old well; all are still at the Hermitage and can be seen by visitors at the convention.

THE HERMITAGE

Old home of Andrew Jackson, located twelve miles from Nashville. It is second only to Mount Vernon in historical interest.

THE PARTHENON

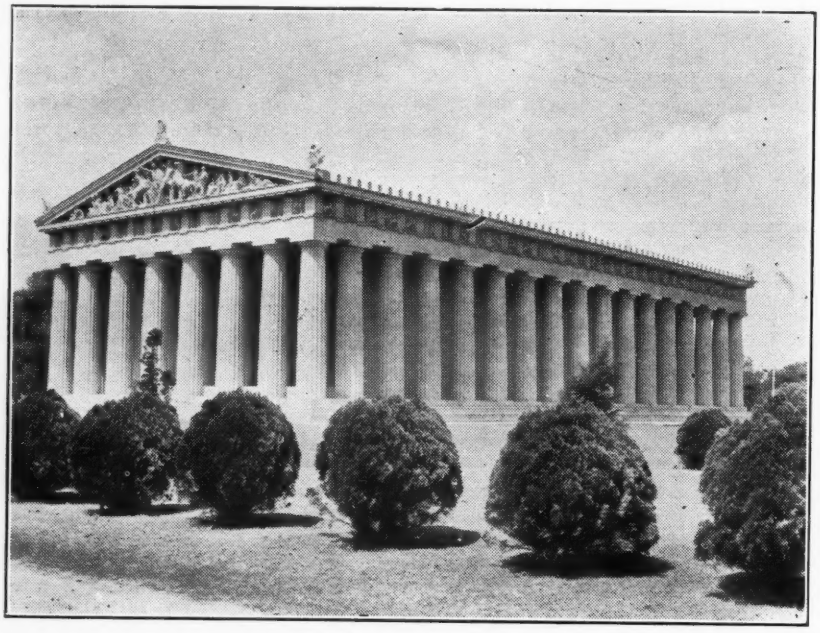
Nashville has a building of which any city would be proud, the Parthenon, which stands in beautiful Centennial Park, the only exact replica of the old Grecian structure to be found in the world. It is reproduced to measurements and casts taken from the old Elgin marbles and other relics saved from the structure that so proudly graced the Acropolis at Athens. The figures, frieze work, pediments, metopes and details are as exactly like those of the old Parthenon as can be made. The old Grecian figures and animals, the architecture that marveled the world, all this is in the Parthenon.

The first reproduction was made for the Tennessee Centennial Exposition of 1897 and was built of laths and plaster, intended only for that celebration. So popular did the structure become that visitors came from all over the world to see Nashville's Parthenon; and when the Exposition Grounds were taken over by the city park board of Nashville as a park, this was the only building of the group that was left standing. Time and the elements slowly caused the building to deteriorate, and it was decided to rebuild it of permanent

material, and as it now stands it is of concrete, naturally colored and finished until it resembles the old stone and marble of the Parthenon. It is considered one of America's greatest pieces of architecture, and today interest in it is just as great as when it was first erected. At the present time the interior is being prepared to house an art gallery that will rival any in this country.

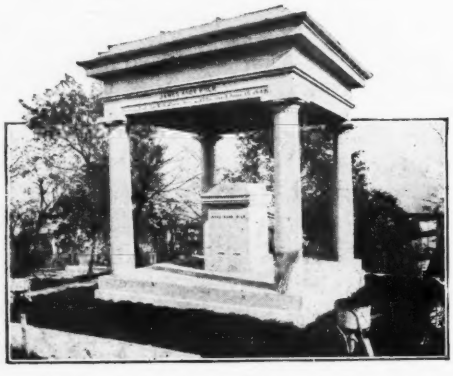
TENNESSEE STATE CAPITOL

Tennessee's State Capitol building has been termed one of the greatest pieces of early American architecture to be found in the country. It stands on the highest point in the



THE PARTHENON

Only exact replica of the old Grecian Parthenon to be found in the world, located in Centennial Park, Nashville.



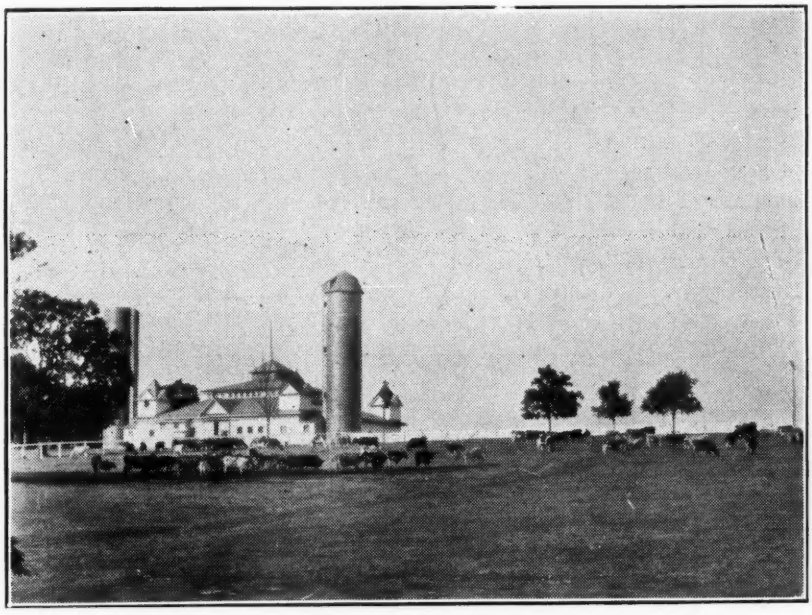
TOMB OF PRESIDENT JAMES K. POLK

Located on Capitol Hill, Nashville, Tennessee, where both President and Mrs. Polk are buried.

city and overlooks the beautiful Middle Tennessee Basin. It was started in 1845 with the famous architect, William Strickland, as its designer. It was not completed until 1859, and before its completion Strickland died and was buried in a crypt on one of the porches of the building. Its quaint design with its tower that arouses the interest of all is unique. On the grounds surrounding the capitol will be found the famous equestrian statue of "Old Hickory," and near by is the grave of President James K. Polk and his wife. Sam Davis, the boy hero of the Confederacy, is memorialized in a statue that stands at one of the entrances to the

grounds, and a monument to Edward Ward Carmack, former United States senator, occupies the front elevation to the entrance to the grounds.

Tennessee's magnificent War Memorial Building is just across the street from the Capitol, and it, as well as the Capitol proper, is occupied by state offices. It is another of the city's imposing structures.



DAIRY SCENE NEAR NASHVILLE

Dairying is rapidly becoming one of the most important industries of middle Tennessee, and this is a scene on one of the finest dairy farms in that section.

WHERE MOUNTAIN, RIVER AND RAIL MEET

One of the side trips offered in Nashville is a trip to Chattanooga; this scene shows the railroad going around the foot of Lookout Mountain, near Chattanooga, with the river on the opposite side.

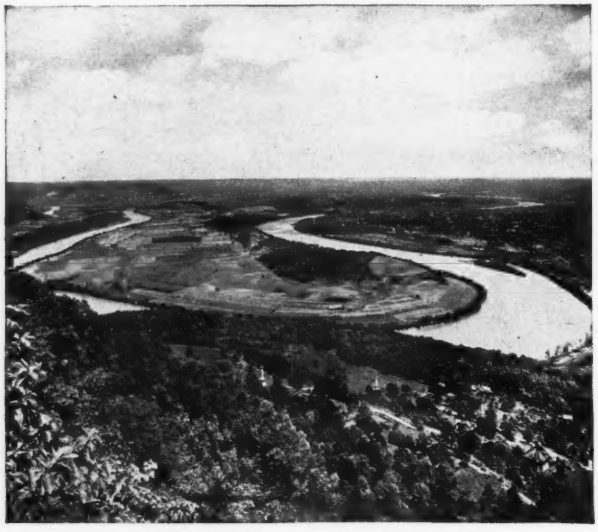
In the downtown district is to be found another structure that holds historic interest; this is the famous old Maxwell House, noted in earlier days as one of the finest hostelries of America. During the war between the States, the Maxwell House was, at different times,

the headquarters of both the Southern and Northern troops. It became a hospital during the Battle of Nashville and has always been one of the most interesting points in the city. It has been modernized and is just across the street from the Hotel Noel where the convention will be held.

Old Fort Negley, one of the most noted forts of the South during that struggle, is in south Nashville, many of the old walls and other parts of the fort remain, and this is soon to become a national park. The National Cemetery is located on the Gallatin Highway, just at the edge of the city and the Confederate Monument is in Mount Olivet Cemetery.

Nashville's famous educational section is noted as one of the most imposing in America. Beautiful Scarritt College for Christian Workers is one of the finest school structures in the world. The new West End Methodist Church Educational Building is rated as one of the most thorough and complete Sunday school structures of the country and one of the most beautiful buildings of the city and has been completed recently.

It is hoped that a drive through the city to the points of interest and through the educational section may be included in the program for the convention, and if so it will embrace the Hermitage, the Parthenon and other points of interest.



MOCCASIN BEND, CHATTANOOGA

View from Lookout Mountain showing the beautiful windings of the Tennessee River as it bends into the shape of a giant foot, known as Moccasin Bend.

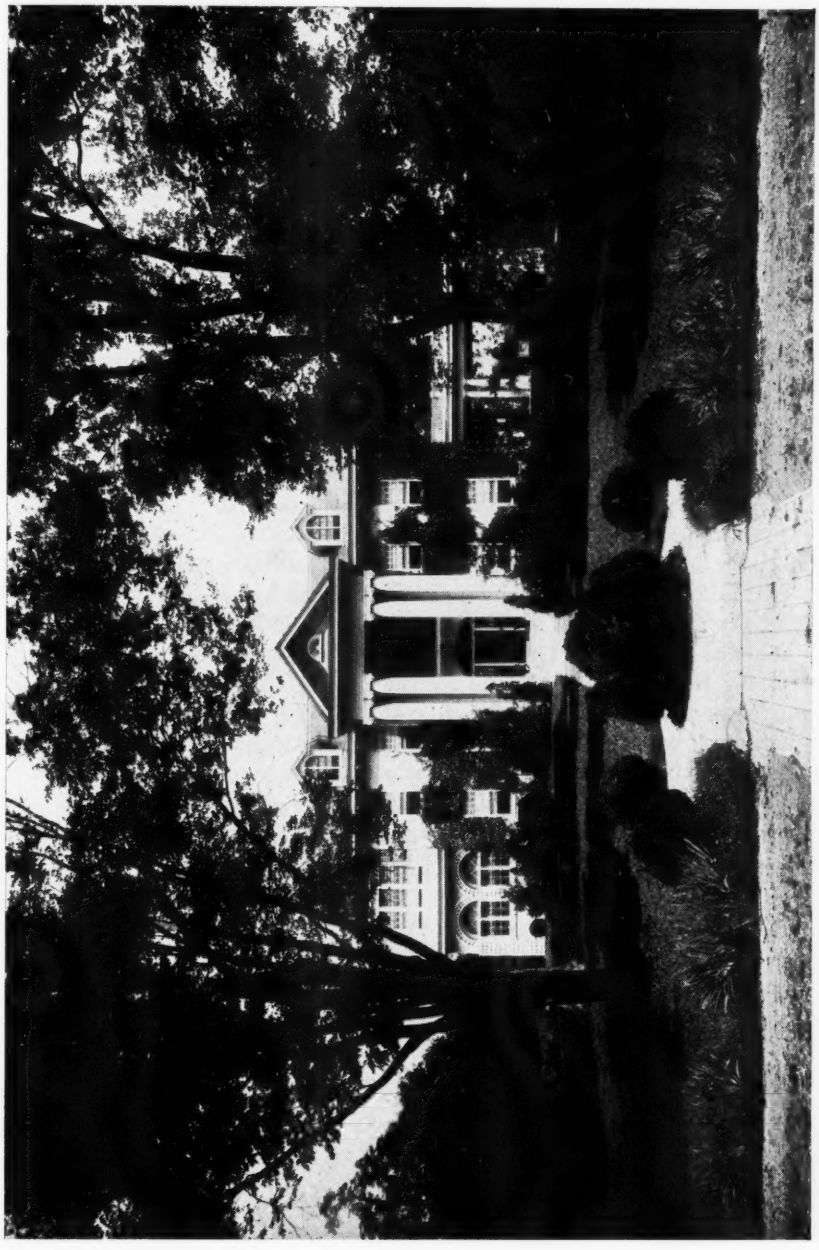
OLD HICKORY

Just a short distance from the Hermitage and eleven miles from Nashville is Old Hickory, an industrial village of 12,000 people that is now the home of the DuPont Rayon Company, the DuPont Cellophane Company, and a chemical plant. This city occupies the site of the famous Old Hickory Powder Plant that was erected by the government during the war and was the largest such plant to be erected during that time. It was a complete city in itself and had every modern facility and advantage. At the close of the war the government planned to dispose of this as best it could, and the Nashville Industrial Corporation was formed by business men, through the Nashville Chamber of Commerce, to save this as an industrial site. The property was purchased, and much of it was later sold to the DuPont interests.

NEAR-BY INTERESTING POINTS

Those coming by auto, and all, are assured that Tennessee will offer one of the best systems of state highways to be found in the country, and will find many side trips that will interest them, either during or after the convention. One of the most interesting of these is a visit to Chattanooga, one of the South's most interesting and historical cities. Leaving

Nashville over the Dixie Highway the traveler will find a hard surfaced route the entire trip. At Murfreesboro, thirty-two miles from Nashville, is to be found the site of the famous battle of Stones River, one of the bloodiest battles of the Civil War. The highway passes by the beautiful National Cemetery where more than 6,000 Federal soldiers are buried; and as the roadway crosses Stones River just before entering Murfreesboro, it goes through the old



A SAMPLE OF SOUTHERN ARCHITECTURE

One of the old colonial mansions to be found in the residential district of Nashville, the city being noted for its beautiful homes and residences, as well as for its public buildings.

fortifications. Murfreesboro is another educational center. From there the highway goes through a rich agricultural section, until the Cumberland Mountains are reached; and the trip over the mountains through Sewanee, where the University of the South is located, Mont Eagle, and other noted places, will then lead into Chattanooga with its famous Lookout Mountain, Signal Mountain, Chickamauga Park, Missionary Ridge and other points.

Another interesting trip is to Muscle Shoals, the site of the much discussed power plant that is one of the greatest in America. On this trip one passes through the city of

Franklin, where another of the great battles of the Civil War was fought, through Columbia and one of the richest agricultural sections of the state, and thence into Alabama for a visit to Muscle Shoals.

Mammoth Cave, Kentucky, one of the world's greatest wonders, is but a short journey north of Nashville, and a drive there would pass through the famous dark-fired tobacco fields of the South. Mammoth Cave has long been noted for its famous subterranean passages that never fail to excite the curiosity and interest, as well as wonderment, of all visitors.

Another trip that would prove equally as fascinating is to Knoxville, the home of the University of Tennessee and other noted institutions, and thence to the Great Smoky Mountain National Park of Tennessee and North Carolina, and Asheville is but a short distance from there.

Nashville is preparing to do its utmost to make the convention of the American Society of Orthodontists one of the most interesting and enjoyable that the organization has ever held. All Nashville joins in saying to the orthodontists, "Come on to Nashville where true Southern hospitality will be found on all sides and a big welcome awaits you. Bring the ladies, there will not be a dull moment for them."

American Society of Orthodontists Meeting

The dentists of Nashville and Tennessee are honored in being hosts to the American Society of Orthodontists at their annual meeting which will be held in Nashville April 8, 9, 10 and 11. The profession is honored that one of the members of our local and state association is serving as president. It will be the pleasure of each member to assist in making the stay of our guests in Nashville and Tennessee most pleasant and profitable.

A foreword in the program gives the first day to a golf tournament and trap shooting. The golf tournament will be held at the Bellemeade Country Club, which has one of the most famous courses in the South. The trophies for the golf tournament and the trap shooting are very worthy of the meet, either of which any member would be glad to possess.

Do not hesitate to bring your wife, as there has been planned a most delightful series of entertainments for the ladies during this meeting. Full details appear in the program. One of the main features of entertainment during the meeting will be the dinner and dance of the American Society of Orthodontists. The scientific program is reported to be one of the largest that has ever been presented to the society.

We hope that every member of the American Society of Orthodontists and those interested in the science of orthodontia will take advantage of this wonderful opportunity to attend. We assure you that your visit will be both pleasant and helpful.

C. W. Hoffer, General Chairman,
Nashville, Tennessee.

Golf

A golf tournament for the members and guests of the American Society of Orthodontists will be held at the Bellemeade Country Club on Monday, April 7. Play will begin at 9 o'clock. Thirty-six holes of golf may be played with the privilege of turning in the score for the better eighteen holes. Certified club handicaps should be turned in to the committee before the play begins.

The trophies will be as follows:

1. Low gross, donated by Baker & Company, Newark, New Jersey.
2. Runner-up low gross, donated by Ritter Dental Manufacturing Company, Rochester, New York.
3. Low net, donated by Goldsmith Bros., Chicago, Illinois.
4. Runner-up low net, donated by C. V. Mosby Publishing Company, St. Louis, Missouri.
5. Booby, donated by the Nashville Dental Supply Company, Nashville, Tennessee.
6. Most birdies, donated by T. M. Crutcher Dental Depot, Nashville, Tennessee.
7. Low gross for best ball nine holes, donated by Oren A. Oliver, president, American Society of Orthodontists.

8. Runner-up for best ball nine holes, donated by a friend of the society.
9. and 10. Guest prize to members of other orthodontic societies donated by friends of the society.

A player cannot be awarded more than one trophy.

Anyone desiring further information, communicate with Dr. J. G. McDowell, 1002 Medical Arts Bldg., Nashville, Tennessee.

Committee: F. M. Casto, J. H. Phillips, Carl Mott, W. P. Fly, Dr. J. G. McDowell, chairman.

Entertainment for the Ladies

Dinner in the private dining room of the Noel Hotel, followed by a bridge party on Tuesday at 6:30 P.M., April 8, 1930.

Tea at the Bellemeade Country Club on Wednesday at 4 P.M., April 9, 1930.

Annual dinner and dance at the Noel Hotel on Wednesday at 7 P.M. Program arranged and presented through the courtesy of Signor Gaetano de Luca, president of the Nashville Conservatory of Music.

Assemble for drive to the Hermitage, historic home of Andrew Jackson, where lunch will be served on Thursday at 12 M., April 10, 1930.

Ladies' Committee—Mrs. O. A. Oliver, Mrs. H. H. Holder, Mrs. Leonard Pogue, and the wives of the local chairmen.

Tentative Program of the Nashville Meeting

TUESDAY, APRIL 8, 1930

Morning Session

8:00 A.M. Registration.
9:00 A.M. Business Session.
Address of Welcome—Governor Henry H. Horton.
Response—William C. Fisher, New York City.
9:30 A.M. President's Address. By Oren A. Oliver, Nashville, Tenn.
10:00 A.M. Business Session.
Report of Board of Censors—Leuman M. Waugh, chairman.
Report of Secretary-Treasurer—Charles R. Baker.
Report of Librarian—Abram Hoffman.
10:30 A.M. Structural Features Related to Orthodontic Materials and Appliances. By R. C. Brumfield, B.S. in C.E., New York City.
Discussed by F. N. Menefee, Ann Arbor, Mich.
11:30 A.M. Case Report. By H. C. Metz, Pittsburgh, Pa.
12:00 M. Case Report. By Paul D. Lewis, Seattle, Wash.
12:30 P.M. Adjournment.

Afternoon Session

1:30 P.M. Diagnosis and Treatment of Posterior Occlusion. By Milo Hellman, D.D.S., F.A.C.D., New York City.
Discussed by Ben Lischer, San Francisco, Calif.
4:00 P.M. Case Report. By Allen H. Suggett, San Francisco, Calif.
4:30 P.M. Case Report. By E. N. Bach, Toledo, Ohio.
5:00 P.M. Adjournment.

Evening Session

8:00 P.M. The Common Ground of Orthodontia and Pediatrics. By Royal Storrs Haynes, M.D.
Discussed by Horton R. Casparis, M.D., Nashville, Tenn.

WEDNESDAY, APRIL 9, 1930

Morning Session

9:00 A.M. Business Session.
Reading of Minutes.

Report of Legislative Committee—C. C. Howard, chairman.
Report of Orthodontic Legislative Committee—B. E. Lischer, chairman.

9:45 A.M. Impacted Mandibular Third Molars. By George B. Winter, D.D.S., F.A.C.D., St. Louis, Mo.
Discussed by R. Boyd Bogle, M.D., D.D.S., F.A.C.D., Nashville, Tenn.

10:45 A.M. Ethics. By W. A. Bryan, A.B., A.M., M.D., F.A.C.S., Nashville, Tenn.
Discussed by Lloyd S. Lourie, Chicago, Ill.

11:30 A.M. Case Report. By B. G. DeVries, Minneapolis, Minn.

12:00 M. Case Report. An Open-Bite Case—A Partial Result—Why? By W. W. Woodbury, Halifax, Nova Scotia.

12:30 P.M. Lunch.

Afternoon Session

1:30 P.M. The Trend of Orthodontic Treatment. By Frank M. Casto, M.D., D.D.S., Cleveland, Ohio.
Discussed by H. A. Pullen, Buffalo, N. Y.

2:30 P.M. Case Report. By W. R. Humphrey, Denver, Colo.

3:00 P.M. Case Report. By H. C. Pollock, St. Louis, Mo.

3:30 P.M. Business Meeting.
Committee Reports.
Report of Committee on President's Address.
Report of Inter-Relations Committee—William C. Fisher, chairman.
Report of Research Committee, Albert H. Ketcham, chairman.
Report of Nomenclature Committee—F. A. Delabarre, chairman.
Report of American Board of Orthodontia—Albert H. Ketcham, chairman.
Nomination of Officers.
Selection of Place of Meeting.
Adjournment.

7:30 P.M. Annual Banquet.
Musical program. Short address by Dr. R. Boyd Bogle, President of the American Dental Association.

9:30 P.M. Dance.

THURSDAY, APRIL 10, 1930

Morning Session

9:00 A.M. Business Session.
Reading of Minutes.

9:15 A.M. Nutrition and Growth. By Lafayette B. Mendel, Ph.D., Sc.D., New Haven, Conn.
Discussed by Edward H. Hatton, Chicago, Ill.

11:00 A.M. A Discussion of Infra- and Supraclusion, Clinton C. Howard, D.D.S., Atlanta, Ga.
Discussed by A. LeRoy Johnson, New York City.

12:00 M. Case Report. By H. A. Stryker, San Francisco, Calif.

12:30 P.M. Case Report. By Joseph D. Eby, New York City.

1:00 P.M. Lunch.
Luncheon for past presidents and president-elect.

THURSDAY, APRIL 10, 1930

Afternoon Session

2:00 P.M.-4:00 P.M. Progressive Clinics.

1. Treatment of Neutroclusion. By E. N. Bach, Toledo, Ohio.
2. Class II, Division 2, or Distoclusion, Subdivision. By J. V. Mershon, Philadelphia, Pa.
3. Opening the Closed Bite. By L. J. Porter, New York, N. Y.
4. Fixed Removable Appliances. By H. C. Pollock, St. Louis, Mo.
5. Closing the Open-Bite. By A. H. Ketcham, Denver, Colo.

6. Treatment of Missing and of Impacted Teeth. By D. S. Sterrett, Erie, Pa.
7. Open-Bites. By C. C. Howard, Atlanta, Ga.

4:00 P.M.-6:00 P.M. General Table Clinics.

1. Appliances Showing Secure Force Control for Lingual Movement of Incisors and Buccal Movement of Canines and Premolars. By Harvey A. Stryker, Santa Ana, Calif.
2. Extraoral Radiographs. By G. L. Turner, Wichita, Kan.
3. Subject to be announced. By Harry B. Wright, Philadelphia, Pa.
4. Subject to be announced. By A. S. Ashplant, Newburg, N. Y.
5. Different Methods of Treatment of Impacted Canines. By E. E. Richardson, San Francisco, Calif.
6. A Few Helps in Special Appliances for Individual Cases. By A. C. Gifford, Oshkosh, Wis.
7. Photographic Display. By H. L. Parks, Atlanta, Ga.
8. Useful Graphs for the Business Side of Orthodontia. By Louis S. Winston, Houston, Texas.
9. Subject to be announced. By W. A. McCarter, Topeka, Kan.
10. Cast Gold Retainers. By T. W. and H. H. Sorrells, Oklahoma City, Okla.
11. Subject to be announced. By F. H. Harrison, Waco, Texas.
12. Blood Control in a Case of Hemophilia. By Wilson R. Flint, Pittsburgh, Pa.
13. Impacted Canines. By Clifford G. Glaser, Buffalo, N. Y.
14. Subject to be announced. By A. Hoffman, Chicago, Ill.
15. Subject to be announced. By Frank Perry, Montgomery, Ala.
16. Subject to be announced. By Claude R. Wood, Knoxville, Tenn.
17. Labial Springs. By A. J. Jackson, Philadelphia, Pa.
18. The Anterior Position of Canine Roots as a Factor in Effecting Retention, and an Efficient Method of Its Correction. By H. B. Robison, Hutchinson, Kan.
19. The Kardex System as Applied to Orthodontic Records. By O. W. Brandhorst, St. Louis, Mo.
20. The Inlay Attachment for Deeply Impacted Canines. By Frank Nicolai, Brooklyn, N. Y.

FRIDAY, APRIL 11, 1930

Morning Session

9:00 A.M. Business Session.
Reading of Minutes.

9:15 A.M. Further Development of the Dental Arches. By T. Wingate Todd, F.R.C.S. (Eng.), Cleveland, Ohio.
Discussed by Milo Hellman, New York City.

11:00 A.M. Diagnosis and Treatment of Anterior Occlusion. By Alfred P. Rogers, D.D.S., Boston, Mass.
Discussed by William E. Flesher, Oklahoma City, Okla.

12:00 M. Case Report. Treatment of Adult Open-Bite Cases by Grinding Occlusal Surfaces of Posterior Teeth. By Herbert A. Pullen, Buffalo, N. Y.

12:30 P.M. Lunch.

Afternoon Session

1:30 P.M. Case Report. By B. E. Lischer, San Francisco, Calif.

2:00 P.M. Diagnosis and Treatment of Neutroclusion. By Martin Dewey, M.D., D.D.S., F.A.C.D., New York City.
Discussed by A. Hoffman, Chicago, Ill.

4:00 P.M. Business Meeting.
Installation of Officers.
Inaugural Address. By Harry E. Kelsey, Baltimore, Md.
Adjournment.

The American Board of Orthodontia

A meeting of the American Board of Orthodontia will be held at the Noel Hotel, Nashville, Tennessee, on April 7, 1930, beginning at 9 A.M.

Those orthodontists who desire to qualify for a certificate from the Board as outlined in the article entitled, "The American Board of Orthodontia," Page 50, January issue of the INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY, may receive full information and application form from Dr. B. Frank Gray, Secretary, 209 Post Street, San Francisco, California.

St. Louis Study Club of Dentistry

The St. Louis Study Club of Dentistry was established for the purpose of teaching advanced dental subjects to ethical dentists, without charge. This organization, founded in 1919 and in continuous operation since that time, has completed its twelfth annual term. The occasion will be marked by a clinic and dinner at the Hotel Chase, Kingshighway at Lindell Boulevard, on Wednesday, April 2, 1930.

The clinic, which will start promptly at 3 o'clock, will consist of the following subjects: dental ceramics; oral prophylaxis; fixed bridge technic; rizadontia (root canal technic); anatomy and dissection of the head; tooth form and cavity preparation; dental roentgenology; full dentures; dental economics; conduction and local anesthesia; crown and inlay casting technic; oral diagnosis and diseases of the mouth; ultraviolet light and its application to dentistry.

At the conclusion of the clinic, a dinner will be given at 6:30 o'clock as a tribute from the students to their instructors. Ethical members of the profession are invited to attend both the clinic and dinner.

Bulletins descriptive of the study club may be had by addressing Dr. F. C. Rodgers, 903 Missouri Theater Building, St. Louis, Mo.

Testimonial Dinner to be Held in Boston

In appreciation of his contribution to the profession during fifty years of practice there will be a testimonial dinner tendered to Dr. James H. Daly, at the New University Club, Boston, Mass., on Wednesday, March 12, 1930.

EDWARD F. SULLIVAN, D.M.D., Secretary of Committee,
520 Beacon Street, Boston, Mass.

Dental Society of the State of New York

The Dental Society of the State of New York will hold its sixty-second annual meeting in New York City, May 12, 13, 14, 15, and 16, 1930, at the Hotel Commodore.

Missouri State Dental Association to Meet in St. Louis

The 1930 meeting of the Missouri State Dental Association will be held in St. Louis, May 19, 20, 21, and 22, at the Hotel Jefferson.

Dr. E. H. Keys, the president, in conjunction with the various committees, is outlining an unusual program. The entire dental profession is invited to attend the meeting.

Annual Meeting of New York Society of Orthodontists in March

The annual meeting of the New York Society of Orthodontists will be held at the Hotel Commodore, Wednesday, March 12. It will be an all-day session, beginning at 9:30 A.M. An exceptionally interesting program has been arranged. All physicians and dentists interested in orthodontia are invited to attend.

LOWRIE J. PORTER, Secretary,
730 Fifth Avenue,
New York, N. Y.

Joint Meeting of Physicians and Dentists

The marked extension of the fields of practice common to medicine and dentistry, witnessed by the past decade, has created a growing need for a closer relationship between the two professions.

Recognizing this and to promote such closer relationship, the medical societies of the counties of Kings and Queens and the Second District Branch of the Dental Society of the State of New York have arranged a joint meeting to be held in the building of the Medical Society of the County of Kings, 1313 Bedford Avenue, Brooklyn, New York, during the afternoon and evening of March 10, 1930.

For this occasion there is being gathered from throughout the country the best available talent for the program, so as to present to the physician and to the dentist various important phases of medical and dental interdependence and opportunities for coordinating their common interests. A medicodental meeting on such a large scale is pioneer in character, and it is believed that it will do much for the progress and development of the interrelationship of the professions.

The immediate future will surely witness a more intimate relation of medicine and dentistry and an extension of cooperative movements which promise to become national and even international. Not only should we look forward to joint meetings of local medical and dental societies as a regular occurrence but of state medical and dental organizations and even of the American medical and dental associations. With such a meeting of these associations in 1933, it is not too much to look forward to an International Medical and Dental Congress in New York in 1935 or 36.

The effect of such a cooperative movement upon the practice of medicine and dentistry both in this country and throughout the world will be most profound and far reaching and will benefit countless millions by the better service each of the professions will be enabled to render.

A cordial and urgent invitation is extended to all practitioners of medicine and dentistry to attend the meeting called for March 10 to arouse the interest and to set into operation the activities of local, state, national and international medical and dental organizations along cooperative lines.

Program for the joint meeting of the medical societies of the counties of Kings and of Queens and the Second District Branch of the Dental Society of the State of New York, Monday, March 10, 1930, follows:

3:00 P.M. The Cooperation of the Physician and Dentist in the Recognition of Disease.

Physician's viewpoint	15 minutes
Dentist's viewpoint	15 minutes
Discussion	15 minutes

4:00 P.M. What Justifies the Dentist and the Physician in Advising the Extraction of a tooth?

Dentist's viewpoint	15 minutes
Physician's viewpoint	15 minutes
Discussion	15 minutes

5:00 P.M. to 6:00 P.M. Social hour.
6:00 P.M. Dinner.
8:30 P.M. Scientific session.
Oral Conditions and General Health:

Dentist's viewpoint	30 minutes
Physician's viewpoint	30 minutes
Formal discussion.	

Notes of Interest

Dr. J. LaGrow, announces the removal of his office to Suite 510, Medical Arts Building, 715 Lake Street, Oak Park.

Dr. David Houston announces that Dr. William A. Giblin is now associated with him in the practice of orthodontia, 189 Claremont Avenue, Montclair, N. J.

Dr. Frederick Bogue Noyes announces that Dr. Harold Judd Noyes and Dr. Allan G. Brodie are now associated with him in the practice of orthodontia, Suite 1812, 30 North Michigan Avenue, Chicago, Ill.